Brigard & Castro
Abogados

Apartado 3082

SUPERINDUSTRIA Y COMERCIO
Radicación : 00083947 00029393 Folios: 382 S.A.
Fecha (DDD): 2001-05-03 17:44:54
Tramite : 122 PATENTES D 1 REGISTRO/ 329 COMPLEMEN D
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES 7976
J2700

93

AS: 83.608

E.Mail:bricas@brigardycastro.com.co

Señores
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISION DE NUEVAS CREACIONES
E. S. D.

REF: Expediente No.00 083.947 - Solicitud de Patente
a favor de KIMBERLY - CLARK WORLDWIDE, INC.

Titulada: RECUBRIMIENTO PARA TRATAR SUSTRATOS PARA IMPRESIÓN CON INYECCIÓN DE TINTA INCLUYENDO SOLUCIÓN DE EMBEBIDO PARA VISUALIZACIÓN Y RETENCIÓN DE IMAGEN MEJORADAS, METODO PARA TRATAR DICHOS SUSTRATOS, Y ARTÍCULOS PRODUCIDOS A PARTIR DE ELLOS

RAMIRO CASTRO DUQUE, vecino de Bogotá, portador de la tarjeta profesional No. 1003, obrando como apoderado de la sociedad *KIMBERLY - CLARK WORLDWIDE, INC.*, según lo acredita el documento de poder protocolizado en esa División bajo el número 17397, me permito anexar al presente escrito los siguientes documentos:

1. Copias certificadas por la Oficina de Patentes del Estados Unidos de las dos primeras solicitudes presentadas para la misma invención de las cuales REIVINDICAMOS PRIORIDAD junto con sus correspondientes traducciones del inglés al castellano.

Del señor Jefe atentamente,

RAMIRO CASTRO DUQUE
C.C. No. 170.322 de Bogotá
Código 340
Cra 7a. No. 16-56 Piso 9

Santafé de Bogotá, Mayo 03, 2001
CPB/hsr.

83608-1de2
94

Case # 15260
COLOMBIA

CERTIFICATION

STATE OF WISCONSIN)
) SS
COUNTY OF WINNEBAGO)

I hereby certify that the attached papers constitute an identical copy of the original of U. S. Patent Application corresponding to Serial No. **09/702,093** for

C ATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM

filed on **October 30, 2000,** assigned to Kimberly-Clark Worldwide, Inc. and I further certify that Kimberly-Clark Worldwide, Inc. is a corporation organized and existing under the laws of the State of Delaware, United States of America.

Dated this 22d day of January, 2001, at Neenah, Wisconsin, United States of America.

Melissa A. Blob
Melissa A. Blob, Notary Public
My commission expires: August 1, 2004

(No Legalization)

4 95

PA 3405696

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

January 05, 2001

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***09/702,093***
FILING DATE: ***October 30, 2000***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

T. Lawrence

T. LAWRENCE
Certifying Officer

10-31-00 A

96

10/30/00 Pasa U.S. PTO

1c#32a U.S. PTO 09/702093 10/30/00

In the United States Patent and Trademark Office

Applicants:	Alison Salyer Bagwell et al.	Docket No.:	15260
Serial No.:		Group:	
Filed:	October 30, 2000	Examiner:	
For:	COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED		
Express Mail	EL188515981US	Date:	October 30, 2000

Transmittal Letter
Utility U.S. Patent Application
Plural Inventors

BOX PATENT APPLICATION
ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the above-identified utility U.S. patent application.

Enclosed are:

1. Fifty (50) pages of specification, including a one (1) page Abstract and eight (8) pages of claims.
2. Three (3) sheets of formal drawings.
3. This Transmittal Letter, in duplicate.
4. A copy of the unexecuted Combined Declaration and Power of Attorney.
5. Letter regarding Missing Parts.

The filing fee, pursuant to 37 C.F.R. 1.16(a), (b), (c) and (d), has been calculated as follows:

	Number Filed			Number Extra	Rate	Fee
Total Claims	53	-20	=	33	x 18 =	594.00
Independent Claims	12	-3	=	9	x 78 =	702.00
First Presentation of Multiple Dependent Claims					+ 260 =	
					Base Fee	$760.00
					TOTAL	$2056.00

Please charge Kimberly-Clark Worldwide, Inc. deposit account number 11-0875 for (1) the filing fee indicated in the TOTAL above; and (2) any patent application processing fees required under 37 C.F.R. 1.17.

In the event the filing fee indicated in the TOTAL above has been incorrectly calculated, please charge any additional filing fee or credit any excess in the filing fee to Kimberly-Clark Worldwide, Inc. deposit account number 11-0875.

Pursuant to 35 U.S.C. §120 and/or 35 U.S.C. 119(e), Applicants hereby claim priority from presently copending U.S. Provisional Application No. 60/163,741 entitled "COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM" and filed on November 4, 1999 in the names of Alison Salyer Bagwell; Kelly Dean Branham; Mary E. Farris; and Leonard Eugene Zelazoski.

Please preliminarily amend the specification of the present application by inserting, as the first sentance following the title, the following: "This application claims priority from U.S. Provisional Application No. 60/163,741 filed on November 4, 1999.

Please address all correspondence to: Steven D. Flack, Esq., Kimberly-Clark Worldwide, Inc., Patent Department, 401 North Lake Street, Neenah, Wisconsin 54956.

The undersigned may be reached at: (770) 587-8648.

Respectfully submitted,

ALISON SALYER BAGWELL ET AL.

By: _____

Steven D. Flack
Registration No.: 40,808

CERTIFICATE OF MAILING

I, Steven D. Flack, hereby certify that on October 30, 2000 this document is being deposited with the United States Postal Service, postage prepaid, Express Mail No. EL188515961US in an envelope addressed to: BOX PATENT APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231.

By: _____

Steven D. Flack

X 98

EXPRESS MAIL NO. EL188515981US CASE NO. 15260

UTILITY APPLICATION

ENTITLED

COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM

IN THE NAMES OF

Alison Salyer Bagwell

and

Kelly Dean Branham

and

Mary Elizabeth Farris

and

Leonard Eugene Zelazoski

I, Steven D. Flack, hereby certify that this patent application having affixed thereto an Express Mail mailing number of EL188515981US and addressed to BOX PATENT APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231, is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on October 30, 2000.

By: _____

Steven D. Flack

Date: October 30, 2000

09702093 - 103000

"Express Mail" Mailing Label Number EL189515981US
Date of Deposit October 30, 2000

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office To Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

[illegible]
(Typed or printed name of person mailing paper or fee)

(Signature of person mailing paper or fee)

COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM

09702093 - 100000

Field of the Invention

The present invention relates to coatings for treating ink jet printable substrates, which are intended to receive images when printed by ink jet printing devices. In particular, the present invention relates to coatings for treating textile substrates for ink jet printing, methods for treating said substrates, and articles produced therefrom. Such methods facilitate the use of such substrates in commonly available ink jet or laser printing devices, such as wide or narrow format ink jet and laser printers.

Background of the Invention

Ink jet printing is a non-impact and non-contact printing method in which an electronic signal controls and directs droplets or a stream of ink that can be deposited on a wide variety of substrates. Ink jet printing is extremely versatile in terms of the variety of substrates that can be treated, as well as the print quality and the speed of operation that can be achieved. In addition, ink jet printing is digitally controllable. For these reasons, ink jet methodology has been widely adopted for industrial marking and labeling. In addition, ink jet methodology has also found widespread use in architectural and engineering design applications, medical imaging, office printing (of both text and graphics), geographical imaging systems (e.g., for seismic data analysis and mapping), signage, in display graphics (e.g., photographic reproduction, business and courtroom graphics, graphic arts),

09702093 "030000

and the like. Finally, ink jet printing has now also been used to create an image on a variety of textile substrates. The use of ink-jet printing to create an image on textile fabrics has allowed for the rapid visualization of an aesthetic design on fabric without the use of expensive and often wasteful screen printing techniques. Such ink-jet printing methodology allows a designer or production facility to visualize a finished design in significantly less time than is usually necessary to burn a screen image of the design by typical screen printing methodology.

Both dyes and pigments have been used as colorants for such ink jet ink formulations. However, such materials do not always adhere well to substrates to which the ink is applied. For example, dyes may dissolve upon a substrate's contact with water. Thus images applied employing ink jet methodology may tend to run or smear upon repeated contact, or may be actually removed from the printed surface if exposed to substantial quantities of aqueous media (e.g., if an ink jet printed article is laundered). Moreover, images applied employing ink jet methodology may also tend to fade or washout upon prolonged exposure to visible, ultraviolet and/or infrared light. Furthermore, dyes applied to textile substrates may experience severe dye bleed upon application to the substrate. Finally, the color intensity of the image printed on a textile substrate using ink-jet methodology is often lacking in vibrancy.

The nature of textile substrates also poses specific problems when printing or imaging via ink jet print methods, which are not found with common ink jet substrates (e.g. paper or coated paper). For instance, the textile fibers can vary widely in composition, with each composition presenting a unique set of conditions for acceptable printing of the substrate. For example, cotton substrates may be very absorbent, such as in the case of aqueous-based inks. When ink is ejected from the ink channel of an ink jet printing device, it is rapidly absorbed into the fibers of the cotton substrate. Since these fibers are much larger than the fibers typically found in paper substrates, the color density or appearance of color brightness is significantly diminished due to the lack of retention of the colorant at the surface of the fibers. In addition, bleeding, mottle of the print pattern, and loss of image sharpness or clarity can often result from printing on the textile fabric itself.

Conversely, synthetic fibers such as polyester may be poorly wet by the aqueous inks and such inks may be only retained in the interstitial spaces between the fibers. This limited ink retention also causes the print-quality related problems outlined above.

Furthermore, the permanence of the printed image on textile fabrics is often achieved commercially by some post-printing curing process such as heating, steaming, or chemical fixation. These processes tend to be inefficient, requiring further washing and

09702093 - 102000

drying steps to remove unfixed colorant from the fabric. It is therefore desirable to enhance the permanence of the printed image on ink jet printable substrates, either in the presence or absence of a post-printing curing process step.

Polymeric materials are typically used commercially to modify the properties of both natural and synthetic textile fibers and substrates. These polymeric treatments may alter textile appearance or hand, reduce shrinking, reduce flammability, or alter other properties of the fiber or substrate. Treatments may even be employed to enhance the ease of printing and/or print performance when commercial printing processes, such as rotary screen printing, are employed. For instance, polyethylene oxide has been used to pretreat a starting cloth material so as to create an adequate textile substrate for ink-jet printing. As disclosed in U.S. Patent number 5,781,216 to Haruta et al., the use of polyethylene oxide treated textile substrates are described as being highly capable of providing images of great color depth with sufficient brightness and sharpness, but free of objectionable color bleed. While Haruta discloses such a polyethylene oxide pretreatment with a cationizing agent, to thereby enhance the coloring ability of images, Haruta requires such treatment to thereafter be cured by additional heating, washing and drying steps.

Use of cationic polymers as part of a latex saturant in a hydroentangled fibrous web is disclosed in PCT US 98 12712 to Harris et al., which was published as WO99/00541. As described in WO99/00541, latex saturation is typically followed by a drying step or other curing aids.

Use of imbibing solutions with sodium bicarbonate, sodium carbonate and urea are also known. Such imbibing solutions are typically used by textile mills in ink pastes along with other additives such as thickeners, and not in conjunction with coating treatments on the textile substrates themselves prior to being printed. The ink pastes are then rotary screen printed down onto the fabric substrates. However, an ink jet paste delivery system can not be used for ink jet printing because of the physical constraints of the ink jet printer technology. The salts in the pastes will corrode the ink jet printer heads. Use of ink pastes are also a wasteful process. Furthermore, even with the use of such pastes in a convention screen printing process, the process experiences a large amount of dye wash off following printing.

Accordingly, there is still a need in the art for ink jet printable substrate coatings and treatment methods which provide for high optical density with a minimum amount of bleeding on the substrate during and after imaging from ink jet printers. There is also a need in the art for such ink jet printable substrate treatment methods which can be applied to textile fabric substrates. In this regard, there is still a need in the art for methods for treating fabrics for receiving ink-jet ink formulations, which methods allow for improved

102

colorfastness and color intensity in a wide variety of textile substrates. Finally, there is still a need in the art for such substrates which are not dependent upon an ink curing step for construction.

Summary of the Invention

In accordance with the present invention, it has been discovered that the color density and quality of the printed image, and the adhesion properties and/or colorfastness of acid and reactive dye-based ink jet ink formulations when applied to a variety of ink jet printable substrates, can be improved by treating the substrates with coating formulations used in conjunction with imbibing solutions. In particular, a wide array of textile fabric substrates can be treated to improve the colorfastness and washfastness of ink jet ink formulations. The treatment formulations include an aqueous coating formulation containing solids and comprising a cationic polymer or copolymer, a fabric softener, urea and either sodium bicarbonate, sodium carbonate, or a combination thereof for reactive dye based inks, or in the alternative, the same cationic polymers, and fabric softaners, but additionally urea and ammonium sulfate for acid dye based inks. In particular, the treatment formulations include about 5-95 % cationic polymers or copolymers, and about 5-20 % fabric softaners. Alternatively, the formulations may also include about 0-80% of a polymeric latex binder so as to increase washfastness. These percentages are based on solids. Total solids content for the formulations typically range from about 10-50 %. In an alternate embodiment, use of cationic polymer coatings in conjunction with a separate imbibing solution of either sodium bicarbonate or sodium carbonate and urea for reactive dye classes may be used. In an alternate embodiment, use of cationic polymer coating formulations in conjunction with a separate imbibing solution of ammonium sulfate and urea for acid dye classes may be used. The present methods provide pathways to the fixation of dyes, irrespective of chemical class or textile fabric substrate, and do so without the need of any further ink curing process beyond drying under ambient conditions. In addition, efficacy of post printing processes such as steaming or curing may be enhanced by such formulations, reducing dye waste and further enhancing color vibrancy. Also, fixation of pigment or colorant may be enhanced by these formulations.

These and other features and advantages of the present invention will become apparent after a review of the following detailed description of the disclosed embodiments and the appended claims.

Brief Description of the Drawings

FIGS.1A-1C illustrate exemplary cationic polymers for use in treatment formulations for substrates in accordance with the present inventive methods.

FIG.2 illustrates a schematic view of a dip and squeeze process for treating ink jet printable substrates.

Detailed Description of the Invention

In accordance with the present invention, there are provided aqueous coatings and methods to improve the adhesion properties and/or colorfastness/color density and washfastness of ink jet printable substrates in the absence of a heating or post treatment curing step, said methods including treating a textile substrate with an aqueous coating formulation including cationic polymers or copolymers and fabric softeners. In a desirable method, the method comprises treating a textile substrate with an aqueous coating formulation including about 5-95 % cationic polymers or copolymers, and about 5-20 % fabric softeners. As has been stated earlier, these percentages are percent of total solids, unless otherwise stated. For the purposes of this application, the percent of the total solids is calculated by dividing the dry parts value for a particular component by the total dry parts of all of the components of the formulation. The present invention is further directed to a treated ink jet printable substrate wherein the treatment comprises an aqueous coating formulation of cationic polymers or copolymers and fabric softeners. A desirable embodiment of the present invention is a treated ink jet printable substrate wherein the aqueous coating treatment comprises about 5-95 % cationic polymers or copolymers, and about 5-20 % fabric softeners.

The cationic copolymers function in the formulation to attract and fix oppositely charged anionic dye molecules to the substrates, and in particular, textile fabric substrates. The polymers or copolymers may contain reactive residues or groups capable of crosslinking to the textile fibers, with themselves, or with other components present in the formulation. Such cationic resins may incorporate charge groups in the main polymer chains or polymer backbones, or as side groups in the polymer chains. An exemplary list of the structural formulas of such cationic polymers are illustrated in Figs. 1A-1C. The cationic polymers for use in the coatings may include but are not limited to, polymers and copolymers of diallyldialkyammonium monomers such as diallyldimethylammonium chloride, cationic acrylate and acrylamide such as acryloxyethyldimethylammonium

09702093 .102000

chloride or acrylamidoethyldimethylammonium chloride monomers, quarternized vinylpyridine such as methyl vinylpyridine chloride, and polyalkylamine polymers and copolymers. Co-monomers in such systems may consist of ones which modify the flexibility, hydrophobicity, or mechanical properties of the polymer molecule. In addition, reactive and/or self-condensing monomers may be included to enhance adhesion to the textile fiber or other components in the formulation. Other examples of cationic polymers with charged groups in the main chain include epihalohydrin-amine polymers such as Reten™ 204 LS and Kymene™ 557 LX polymers of Hercules Incorporated, of Wilmington, Delaware. A specific example of a preferred cationic polymer resin is CP 7091 RV available from ECC International of Roswell, Georgia, with CP 7091 RV being a poly(diallyldimethlammonium chloride-co-diacetone acrylamide).

Suitable fabric softeners which may be used in accordance with the present inventive coatings/methods include, but are not limited to, Varisoft 222 of the Witco Corporation of Greenwich, Connecticut, Adogen 432 also of the Witco Corporation, Accosoft 550-75 of the Stepan Company of Northfield, Illinois, Alubrasoft Super 100 and Alubrasoft 116 of the BASF Corporation, Specialty Chemicals Division of Mt. Olive, New Jersey, and Ahcovel Base N-62 of ICI Surfactants or Hodgson Textiles Chemical of Mt. Holly, North Carolina. Suitable fabric softeners include those that are cationic or nonionic and provide the attributes of print quality and image brightness to the printed textile substrate. The fabric softener most suitable to a particular textile fabric substrate varies by fabric substrate. For instance, it has been found that the fabric softener Varisoft 222 performs better with cotton/banner fabric samples while Adogen 432 performs better with nylon/lycra samples.

In another embodiment of the present invention, the previously described coating treatments or formulations for ink jet printable substrates also include a latex binder in order to further enhance the adhesion and/or waterfastness of colorants on the textile fabric substrates. It has been found that coated ink jet receptive substrates including a latex binder provide high color density and saturation, superior print quality, reduction of wicking or bleeding, and enhanced ink absorption. Furthermore, the coating or treatment formulations provide a waterfast printed image when printing via an ink jet printing process, without the necessity of post-printing curing steps such as heating, steaming, chemical fixation, or radiation. Likewise, the present invention is also directed to a treated ink jet printable substrate wherein the treatment comprises an aqueous coating formulation of cationic polymers or copolymers, fabric softeners, and a latex binder. A desirable embodiment of the present invention is a treated ink jet printable substrate wherein the

Ex 105

aqueous treatment formulation comprises about 5-95 % cationic polymers or copolymers, about 5-20 % fabric softeners and about 0-80% latex binder.

The treatment or coating formulations in this alternate embodiment consist primarily of cationic polymers and copolymers, fabric softeners and a water-insoluble polymer in the form of a latex dispersion or emulsion. In particular, the treating formulation may include about 0-80 % polymeric latex binder depending on the textile fabric substrate. The latex reinforcing polymers may be either nonionic or cationic. By way of example only, the latex materials may include vinylacetate, ethylene-vinylacetate, acrylate, styrene, and styrene-acrylate resins and other cationic or nonionic latexes. These resins may include reactive or self cross-linking groups in addition to inherent cationic functionality.

The aqueous coating formulations may also include other additives which effect the appearance or tactile properties of the finished substrate, such as optical brighteners. It should be recognized that all of the stated percentages are based on solids unless otherwise noted. Total solids content for the formulations typically range from about 5-50 %, but desirably range from about 5-32 %. More desirably the total solids content for the formulations range from about 25-28 %.

Treatment formulations (compositions) for the textile substrates are made by adding the above components from stock solutions or dispersions, or as solids where appropriate, and mixing to homogeneity. Application of the treatment formulation to the textile substrates may be carried out by any known means to those having ordinary skill in the art. For instance, fabric substrates may be treated by a standard padding (dip and squeeze) method and dried in a forced air oven, although any suitable drying means of textiles known to those skilled in the art may be employed. As can be seen in FIG.2 showing a schematic view of a dip and squeeze process 10 for treating ink jet printable substrates, a textile substrate 20 is unwound from the incoming roll 30 and is then dipped in a saturator tank/bath 40 for sufficient time for it to become saturated with the treating formulation. The textile substrate is then run through a pressurized nip roll set 44 and 46. The pressure on the rolls should be in the range of about 10-120 psig but desirably in the range of about 10-65 psig, depending on the type of textile fabric substrate utilized, and the total solids content of the treatment formulations used. The pressurized nip rolls squeeze the coating evenly onto the substrate so as to penetrate the surface of the substrate. The rolls may be either rubber or steel, however a set of rolls in which at least one roll being rubber is desirable. Following passage through the nip pressure rolls, the textile substrate is coursed through a drying means 50. The drying means may include a tenter frame for holding the textile substrate, and may itself encompass multiple consecutive drying means depending on the nature of the substrate to be dried. The

0092020260 :20000

106

drying temperature is desirably in the range from about 200° F to 325° F, desirably between about 220 to250° F. The typical time for drying is between about 30 seconds and 3 minutes. Following drying, the finished treated textile substrate is taken up on a wind up roll 52. The textile substrate may be rolled up for storage or moved to a second lamination process in preparation for ink jet printing. The textile substrate may be laminated to a carrier backing for ease of printing.

Using this application method, dry pick-up ratios of the textile substrate may vary from about 0.5% to about 50%. Desirably, the dry pick-up ratios may vary from about 3 to about 20%. More desirably, the dry pick-up ratios may vary from about 6 to about 15%. Wet pick-up ratios for the textile substrates are typically between about 30-150%. Desirably such wet pick-up ratios are between about 80-120%. Desirably for Dacron banners, the wet pick up ratios are between about 40-120 %. These terms are defined by equations which follow.

Substrates which may be treated in accordance with the present inventive methods are varied and include paper, fabric, films, and the like, although textile fabric substrates are preferred. Such fabrics may include cotton, silk, wool, polyester, rayon, nylon, and blends thereof. Furthermore, the disclosed ink jet substrates may provide the benefits disclosed herein with or without further post-printing curing steps involving the use of heat, radiation or pressure. Ideally such treated substrates provide adhesion and/or colorfastness of the colorant with only ambient or room temperature curing or drying of the printed image. It should be noted however, that while not being necessary for the process, a post printing curing step may further enhance the colorfastness and washfastness of the printed image on the substrate. The basis weight of the various fabrics which may be treated by these formulations may range from about 2 ounces per square yard (osy) to about 9 osy.

Dye classes which may be used in ink jet printers to be printed on such substrates include acid dyes, reactive dyes, direct dyes, azoic dyes, sulfur dyes, modified dyes, polymeric dyes, copolymerized dyes or other classes of colorants known to those skilled in the art. Furthermore, pigment colorants may be used in the ink jet printers to be printed on such substrates. Additionally, it has been found that when such substrate is printed with ink jet inks containing additives, such as those described in U.S. Application bearing Serial Number 09/109,681 filed July 2, 1998 and U.S. Patent No. 5,697,694 incorporated herein by reference in its entirety, such substrate treatments may be enhanced so as to provide enhanced colorfastness and washfastness.

In a further embodiment of the present invention, such previously described treatment formulations may be used in a method to treat banner textile fabric substrates. Such substrate materials include 100% cotton, 100 % polyester, 100% silk, nylon, rayon and blended materials, such as blends of cotton and polyester, as well as nonwoven materials. For instance, it has been found that the pretreatment of banner textile fabric substrate with an aqueous coating formulation including cationic polymers, fabric softeners, and latex polymer binders in accordance with the previously described methods enable the banner substrates to be ink jet printable, with improved colorfastness/ color density and washfastness, and with reduced color bleed. Likewise, the present invention is also directed to a treated ink jet printable banner substrate wherein the treatment comprises a formulation of cationic polymers or copolymers, fabric softeners, and an optional latex binder. A desirable embodiment of the present invention is a treated ink jet printable banner substrate wherein the aqueous treatment formulation includes between about 5-95 % cationic polymers or copolymers, between about 5-20 % fabric softeners and between about 0-80% latex binder.

In accordance with yet another embodiment of the present invention, there are provided articles produced by the above described methods, employing treated textile substrates as described herein. Such articles may include for example banners, wall coverings and other home furnishing products. Thus according to the present invention, ink jet printed images applied to a treated substrate as described herein, resists removal of said image from said substrate, even upon repeated contact of the printed substrate with water. Such repetitive contact can be the result of normal handling of an article, accidental exposure to liquid, and routine laundering of the article. When articles according to the present invention comprise a treated substrate containing an ink jet image printed thereon, the resulting image adheres sufficiently to said substrate to resist removal therefrom upon washing of said article. The present invention including each of the various embodiments is further described by the examples which follow. Such examples however, are not to be construed as limiting in any way either the spirit or the scope of the present invention.

Preliminary Examples

Textile substrate samples were first printed with a test pattern using a commercial ink jet printer utilizing commercial ink jet inks containing acid, reactive, and/or direct dyes. Color density, color bleed, and print quality were evaluated on the samples as printed. These textiles included cotton poplin textile substrates. Duplicates of both sets of samples were washed using a washing method as described. Color density, color bleed, print

quality or appearance, and color permanence were evaluated using the washed samples. Data from the preliminary examples is expressed in Table 1 which follows.

TABLE 1

INK	INK ADDITIVE	FABRIC TREATMENT	HEAT TREATMENT	COLORFAST EVAL. WATER DELTA E	DETERG. DELTA E
Encad GA	none	none	none	< 56	<82
Encad GA	none	0.5% CP 7091 RV	none	< 29	< 66
Encad GA	none	1.0 % CP 7091 RV	none	< 28	< 50
Encad GA	none	2.0% CP 7091 RV	none	< 27	< 32

DOCUMENT: 2602760

CP 7091 RV= is a diallyldimethyammonium chloride/diacetone acrylamide copolymer, ECC International. Encad GA Inks employ standard monomeric dyes. Samples were hand washed. The sampling tested magenta inks. Delta E was calculated in the samples utilizing the spectrodensitometer and equation described below. The sampling was produced using a dip and squeeze method, as previously described. As can be seen, the coating in the Preliminary Examples only included cationic polymer in the aqueous formulation. Percent represents percent solution.

A second more rigorous set of tests and examples were run on a variety of fabric substrates. These textile fabric substrates include the materials listed in Table 2.

X 8 109

Table 2

FABRIC	STYLE	Construction	SOURCE	BASIS WEIGHT (OZ/YD^2)	BASIS WEIGHT SI UNITS (G/M^2)
Polyester poplin	PP 6248	Plain Weave	Fisher Textiles	3.8	128.8
Polyester satin	PS241	Satin	"	4.1	139.0
250 Denier Dacron Poly.	250 Dacron	Plain Weave	"	3.2	108.5
Cotton Poplin	9680	"	Lorber Indust.	6.5	220.39
Cotton Jersey	5118	Knit	"	8.2	277.9
Cotton Sheeting		Plain Weave	Cranston Mills	7.0	237.2
.16 mm Silk Charmeuse	12104	Satin	U.S. Silk, Inc.	2.0	67.8
Silk crepe dechine .18 mm	14654	Crepe	"	2.3	78.0
Polyester Georgette	NOFU7-6058A	Crepe Georgette	Scher Fabrics, Inc.	3.8	128.8
Polyester stretch crepe		Knit	"	3.2	108.5
Poly./lycra Blend	55153	Knit	Guilford Mills	5.5	186.4
Nylon/lycra blend	58082	Knit	"	4.0	135.6
Rayon	YWSR 1352	Crepe	U.S. Silk, Inc.	3.5	118.6

5

000501-26020760

U.S. Silk, Inc. is located in New York, NY. Gulford Mills is located in New York, NY. Scher Fabrics, Inc. is located in New York, NY. Cranston Mills is located in Cranston, RI. Lorber Industries is located in Gardena, CA. Fisher Textiles is located in Indian Trail, NC.

Conditions for Second Set of Examples

Printing Steps

In each of the following examples, treated textile samples were printed using an Encad Pro E (@ 300dpi) ink jet printer obtained from Encad Inc. of San Diego, California. Encad GA, GS, or GO inks were employed using 4-Pass Enhanced Print Mode, that is with the printer passing over the textile substrate four times. In some instances, as noted as double strike in data tables, the printing head was preheated and option identified as number "7" was selected on the printer. This option enabled more ink to be expelled from the printer onto the substrates. Dyes in the inks consisted of reactive, acid, and/or direct dyes and are described in Table 3 .

TABLE 3

Inks Used

GS Ink		
Color	Order#	Dyes
Cyan	209489	Direct
Magenta	208163-2	Acid /Reactive
Yellow	208163-3	Acid
Black	208163-4	Direct
GO Ink		
Color	Order#	
Cyan	208165-1	Pigment
Magenta	208165-2	Pigment
Yellow	208165-3	Pigment
Black	208165-4	Pigment
GA Ink		
Color	Order#	Dyes
Cyan	209491	Direct
Magenta	209490	Acid
Yellow	208164-3	Acid
Black	208164-4	Direct

Sample sizes were typically 11 by 15 inches. Additionally, a floral three color print, using lavender, green and magenta was used for testing, of approximately 14 by 25 inches in size. Where it was difficult to distinguish between shades of green, a neutral portion (that is free of ink) of the sample was also evaluated.

Color Measurements

L* a* b* color values measurements (CIE 1976 Commission Internationale de l'Eclairage) and optical density were made of the printed textile substrates using an X-Rite 938 Spectrodensitometer (D65/10°) using CMY filters, in accordance with the operator's manual. The X-Rite spectrodensitometer was obtained from the X-Rite Corporation of Grandville, Michigan. Average optical densities were taken as the sum of the average of three measurements using each filter. Delta E is calculated in accordance with the following equation:

$$\Delta E = SQRT\ [(L^*standard - L^*\ sample)^2 + (a^*standard - a^*\ sample)^2 + (b^*standard - b^*\ sample)^2]$$

The higher the Delta E, the greater the change in color intensity. Unless the color's intensity is increased by a curing step, a large increase in delta E would typically be indicative of fading. The testing was in accordance with ASTM DM 224-93 and ASTM E308-90. Where values for delta E are less than 3.0, it is generally accepted that such color change cannot be observed with the human eye. A detailed description of spectrodensitometer testing is available in Color Technology in the Textile Industry, 2nd Edition, Published 1997 by AATCC (American Association of Textile Chemists & Colorists).

Washing Method for Textile Samples

When indicated, textile samples were washed using the following method. Samples were placed in an appropriate size beaker or container such as a one liter beaker. Samples were then placed under cold running water (between approximately 10-20° C) for approximately two minutes. The cold water was then drained from the textile samples. The beakers were then refilled with hot water (between approximately 40-50° C), and one ounce of detergent (Synthrapol ® per gallon of water was added to the beakers).

The textile samples were then washed out for approximately five minutes and then rinsed and drained of remaining water. Finally, the textile samples were rinsed with warm

water (of between approximately 25-30° C) for two minutes followed by a rinse with cold water (of between approximately 10-20° C) for approximately one more minute.

Typically, although not necessarily required for curing, a second set of samples were printed and subsequently steamed using a laboratory steamer for comparison. For the purposes of the examples, if a colorfastness level is characterized as poor, bleeding or wicking has occurred. If a washfastness level has been characterized as poor, the image has washed out. If a colorfastness and washfastness level has been characterized as good, the color vibrancy and image retention is noticeably better than the poor level. If the colorfastness and washfastness levels are characterized as excellent, the color properties and vibrancy are the highest levels with the highest color density.

Examples

It should be noted that for each of the following examples, the textile substrate had been laminated to an adhesive coated paper backing which was obtained from American Bullrite, Inc. under the designation ProtecRite ® 6798 prior to printing to enable the substrate to be easily coursed through the printer. The substrates were then removed from the backing prior to washing. Adhesive coated backing papers identified by the designation 6798 include a paper having a nominal thickness of 5.4 mil, an initial adhesion value of 27 oz/in, a tensile strength of 16 lbs/in, and an elongation capability of 10 %. The batch formulations utilized are described in the followtng example summaries.

Example 1. Cationic copolymer CP 7091 RV (ECC International), poly(diallyldimethylammonium chloride-co-diacetone acrylamide), was obtained in a 49.3% stock solution in water. 20.3 wet parts of this solution (10 dry parts, or approximately 90-91 % of the total dry parts) were added to 70.3 parts water with mixing. 1.1 wet part (1 dry part, or approximately 9 % of the total dry parts) Varisoft® 222 fabric softener (90% in water) was added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried as previously described. A portion of this sample was laminated to an adhesive paper carrier, printed with an ink jet printer and dried under ambient conditions. The properties of the sample were evaluated for quality of the printed image, ink retention, and color density or saturation under the following conditions: 1) immediately after printing, 2) after printing and washing, 3) after printing and steaming, 4) after printing, steaming and washing. The printed samples exhibited superior image quality with little or no bleed, excellent ink

retention, and excellent color density. Samples that were steamed exhibited excellent enhancement of color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. This Example utilized the GS ink set.

Example 2. The formulation employed in Example 1 was used to treat a 100% polyester georgette fabric. Results for this fabric were similar to those obtained in Example 1. This Example utilized the GS ink set and GO ink set.

Example 3. 20.3 wet parts (cationic copolymer CP 7091 RV (ECC International) (49.3% in water)(10 dry parts or approximately 90-91 % of the total dry parts) was added to 48.9 parts water with mixing. 22.5 wet parts Adogen® 432 fabric softener (4.4% in water)(1 dry part, or approximately 9 % of the total dry parts) was added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a conventional padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. This Example utilized the GS ink set.

Example 4. The formulation employed in Example 3 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 3. This Example utilized the GS ink set.

Example 5. The formulation employed in Example 3 was used to treat a 100% silk crepe de chine fabric. Results for this fabric were similar to those obtained in Example 3. This Example utilized the GS ink set.

Example 6. 20.3 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 48.9 parts water with mixing. 11.3 wet parts Adogen® 432 fabric softener (4.4% in water) and 11.3 wet part Varisoft® 222 (4.7% in water) was added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a conventional padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited

0092093 "20020000

23 114

superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. This Example utilized the GS ink set.

Example 7. A treatment composition was formulated as in Example 6, substituting 23.1 wet parts Accosoft® 550 fabric softener (4.3% in water) (1 dry part, or approximately 9 % of the total dry parts) for parts Adogen® 432 fabric softener. The cationic polymer made up 10 dry parts or approximately 90-91 % of the total dry parts. The wet parts of water constituted approximately 48.2 parts. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing of steamed was dramatically increased compared to untreated samples. Some enhancement of colorfastness was achieved without steaming. This Example utilized the GS ink set.

D0E0T"E6020760

Example 8. The formulation employed in Example 7 was used to treat 85/15 nylon/lycra blend fabric. Results for this fabric were similar to those obtained in Example 7. This Example utilized the GS ink set.

Example 9. The formulation employed in Example 7 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 7. This Example utilized the GS ink set.

Example 10. A treatment composition was formulated as in Example 3, substituting 22.7 wet parts Alubrasoft® Super 100 fabric softener (4.4% in water)(1 dry part or approximately 9 % of the total dry parts) for parts Adogen® 432 fabric softener. The formulation included 20.3 wet parts of 7091 RV (10 dry parts, or approximately 90-91 % of the total dry parts), and 48.7 parts water. This formulation was used to treat cotton poplin via a conventional padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance.

AC 115

Permanence of color to washing of steamed samples was dramatically increased compared to untreated samples. Some enhancement of colorfastness was achieved without steaming. The Example utilized the GS ink set.

Example 11. The formulation employed in Example 10 was used to treat 85/15 nylon/lycra blend fabric. Results for this fabric were similar to those obtained in Example 10. The Example utilized the GS ink set.

Example 12. The formulation employed in Example 10 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 10. The Example utilized the GS ink set.

09702093 "EP00200"

Example 13. A treatment composition was formulated as in Example 3, substituting 8.8 wet parts Ahcovel® fabric softener (11.3% in water)(1 dry part, or approximately 9 % of the total dry parts) for parts Adogen® 432 fabric softener. The formulation included 20.3 wet parts of 7091RV (10 dry parts, or approximately 90-91 % of the total dry parts), and 62.5 parts water. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing of steamed samples was dramatically increased compared to untreated samples. Good enhancement of colorfastness was achieved without steaming. The Example utilized the GS ink set.

Example 14. Cationic polymer CP 261LV (ECC International), Poly(diallyldimethylammonium), was obtained in a 43.0% stock solution in water. 23.3 wet parts of this solution (10 dry parts, or approximately 90-91 % of the total dry parts) was added to 47.1 parts water with mixing. 21.3 wet parts Varisoft® 222 fabric softener (4.7% in water)(1 dry part, or approximately 9 % of the total dry parts) was added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited moderate retention of color when washed. Some

2/5/16

enhancement of colorfastness was achieved. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. The Example utilized the GS ink set.

Example 15. 28.8 wet parts of a solution containing 80% ethoxylated polyethylenimine (34.7% in water)(10 dry parts, or approximately 90-91 % of the total dry parts) was combined with 41.6 parts water with mixing. 21.3 wet parts Varisoft® 222 fabric softener (4.7% in water) (1 dry part, or approximately 9 % of the total dry parts) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited moderate retention of color when washed. Some enhancement of colorfastness was achieved. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. The Example utilized the GS ink set.

09702093 "20020750

Example 16. 50.7 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water)(25 dry parts, or approximately 18-19 % of the total dry parts) was added to 658 parts water with mixing. 90.6 wet parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water)(50 dry parts, or approximately 37 % of the total dry parts) of AirProducts and Chemicals Inc. of Allentown, Pennsylvania, 114.9 wet parts PrintRite® 595 acrylic emulsion (BF Goodrich, 43.5% in water)(50 dry parts, or approximately 37 % of the total dry parts), and 212.8 wet parts Varisoft® 222 fabric softener (4.7% in water)(10 dry parts, or approximately 7 % of the total dry parts) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% Cotton Poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. The Example utilized the GS ink set.

Example 17. The formulation employed in Example 16 was used to treat a 100% cotton Jersey knit fabric. Results for this fabric were similar to those obtained in Example 16. The trial utilized the GS ink set.

Example 18. The formulation employed in Example 16 was used to treat an 85/15 nylon/lycra blend fabric. Results for this fabric were similar to those obtained in Example 16. The Example utilized the GS ink set.

Example 19. The formulation employed in Example 16 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 16. The Example utilized the GS ink set.

Example 20. The formulation employed in Example 16 was used to treat a 100% silk crepe de chine fabric. Results for this fabric were similar to those obtained in Example 16. The Example utilized the GS ink set.

Example 21. 50.7 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water)(25 dry parts, or approximately 18-19 % of the total dry parts) was added to 656.0 parts water with mixing. 90.6 wet parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water)(50 dry parts, or approximately 37 % of the total dry parts), 114.9 wet parts PrintRite® 591 acrylic emulsion (BF Goodrich, 43.5% in water)(50 dry parts, or approximately 37 % of the total dry parts), and 212.8 wet parts Varisoft® 222 fabric softener (4.7% in water) (10 dry parts, or approximately 7 % of the total dry parts) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. Little measurable washout was detected. The Example utilized the GS ink set.

27 118

Example 22. The formulation employed in Example 21 was used to treat a 100% cotton Jersey Knit fabric. Results for this fabric were similar to those obtained in Example 21. The Example utilized the GS Ink set.

A sample result for Delta E values is reflected in the following Table 4. It should be recognized that values for delta E can range from 0 to 100 with the lower values being preferred for demonstrating minimum loss of color vibrancy/fading. Delta E values are a comparison of "treated and washed" or "treated and dry cleaned" samples versus "treated" samples. In some instances, Delta E values are a comparison of "treated, steamed, and washed" samples, versus "treated" samples. Textile fabrics which were capable of being printed without a coating experienced poor printing attributes and experienced total washout (with a Delta E theoretically at approximately 100). The following data applies to a Cranston Cotton sample, which was treated with a coating formulation as described in Example 21.

09702093 "260200"

Table 4

TREATED	L*	A*	B*	DELTA E
Magenta	58.0	30.8	-17.6	standard
Treated & Washed				
Magenta	59.0	37.2	-22.9	8.3

Example 23. The formulation employed in Example 21 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 21. This substrate was cleaned using commercial dry cleaning facilities and sample results are reflected in the following Table 5. The Example utilized the GS ink set.

Table 5

TREATED	L*	A*	B*	DELTA E
Magenta	46.9	54.8	-5.2	standard
Black 1	29.5	1.8	0.5	standard
Yellow	83.6	5.0	91.8	standard
Cyan	61.8	-27.9	-31.2	standard
Dry Cleaned				
Magenta	44.7	54.6	-5.0	2.3
Black 1	27.7	1.4	-.03	2.0
Yellow	82.4	4.7	90.3	1.9
Cyan	60.8	-28.5	29.8	1.8

09702093 -100201

Example 24. 10.1 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water)(5 dry parts, or approximately 45 % of the total dry parts) was added to 48.8 parts water with mixing. 11.5 wet parts PrintRite® 591 acrylic emulsion (BF Goodrich, 43.5% in water)(5 dry parts, or approximately 45 % of the total dry parts), and 21.3 wet parts Varisoft® 222 fabric softener (4.7% in water) (1 dry part, or approximately 9 % of the total dry parts) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. The Example utilized the GS ink set.

Example 25. The formulation employed in Example 24 was used to treat an 85/15 nylon/lycra blend fabric. Results for this fabric were similar to those obtained in Example 24. The Example utilized the GS ink set.

Example 26. 10.1 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water)(5 dry parts, or approximately 45 % of the total dry parts) was added to 48.8 parts water with mixing. 11.5 wet parts PrintRite® 595 acrylic emulsion (BF Goodrich, 43.5% in water)(5 dry parts, or approximately 45 % of the total dry parts), and 21.3 wet parts Varisoft® 222 fabric softener (4.7% in water)(1 dry part, or approximately 9 % of the total dry parts) were added, and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. The Example utilized the GS ink set.

Example 27. The formulation employed in Example 26 was used to treat an 85/15 nylon/lycra blend fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was not improved in these samples. The Example utilized the GS ink set.

Example 28. 10.1 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water)(5 dry parts, or approximately 45 % of the total dry parts) was added to 51.2 parts water with mixing. 9.1 wet parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water)(5 dry parts, or approximately 45 % of the total dry parts), and 21.3 wet parts Varisoft® 222 fabric softener (4.7% in water)(1 dry part, or approximately 9 % of the total dry parts) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. The Example utilized the GS ink set.

Example 29. The formulation employed in Example 28 was used to treat an 65/15 nylon/lycra blend fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was not improved in these samples. The Example utilized the GS ink set.

Example 30. 50.7 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water)(25 dry parts, or approximately 18-19 % of the total dry parts) was added to 881.9 parts water with mixing. 181.3 wet parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water)(100 dry parts, or approximately 74 % of the total dry parts), and 11.1 wet parts Varisoft® 222 fabric softener (90% in water)(10 dry parts, or approximately 7 % of the total dry parts) were added and the entire solution was mixed until homogeneous. This formulation was used to treat a 250 denier polyester/cotton banner fabric via a padding application and dried. The sample was printed as described in Example 1. The printed samples exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other steps.

Example 31. 50.7 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) (25 dry parts, or approximately 18-19 % of the total dry parts) was added to 878.0 parts water with mixing. 181.3 wet parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water)(100 dry parts, or approximately 74 % of the total dry parts), and 15.0 wet parts Adogen® 432 fabric softener (66.7% in water)(10 dry parts, or approximately 7 % of the total dry parts) were added and the entire solution was mixed until homogeneous. This formulation was used to treat a 250 denier polyester/cotton banner fabric via a padding application and dried. The sample was printed as described in Example 1. The printed samples exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other steps.

Textile samples in Examples 30 through 35 were printed with the Encad GO ink set obtained from the Encad Inc.

Example 32. The formulation employed in Example 31 was used to treat a polyester poplin fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other curing steps.

Example 33. The formulation employed in Example 31 was used to treat a polyester satin fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other curing steps. In addition, the sample possessed excellent visual color reflectivity. Such quality may be observed visually or measured through diffuse reflectance methods.

Example 34. The formulation employed in Example 31 was used to treat a polyester poplin fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other steps.

Example 35. The formulation employed in Example 31 was used to treat a polyester satin fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other steps. In addition, sample possessed excellent color reflectivity.

Example 36. 50.7 wet parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water)(25 dry parts, or approximately 17 % of the total dry parts) was added to 993.5 parts water with mixing. 230.9 wet parts PrintRite® 591 acrylic emulsion (BF Goodrich, 43.3% in water)(100 dry parts, or approximately 68-69 % of the total dry parts), and 296.3 wet parts Varisoft® 475 fabric softener (6.8% in water) (20 dry parts, or approximately 13-14 % of the total dry parts) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% silk charmeuse via a padding application and dried. Wet pick-up was 140%. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. The Example utilized the GS ink set.

0092092 .20020260

09702093 - 102000

Results of Trials 30-36

The printed images on the textile samples from Examples 29-35 were waterfast and exhibited acceptable lightfastness for outdoor stability in accordance with ASTM test method G26 when printed with Encad GO Inks. ASTM test method G26 included the following steps:

The standard practice under ASTM G26 for operating a light-exposure (xenon-arc type) with and without water for exposure of nonmetallic materials consists of the following procedures. Test method 1 was employed for continuous exposure to light and intermittent exposure to water spray. The type of apparatus used consisted of an Atlas CI 5000 apparatus. The instrument was programmed for continuous light and intermittent water spray in accordance with the manufacturer's instructions. The conventional cycle of 102 minutes of light exposure followed by a cycle of 18 minutes of light and water spray was employed. Such sample data measurements are reflected in the following Table 6. The method of print mode is double strike, at 102 light, 18 min. spray after 6 hours.

Table 6

FR POLY. POPLIN	L*	A*	B*	DELTA E
Black 1	29.0	1.7	-3.3	1.5
Cyan	60.6	-22.1	-38.5	4.2
Yellow	89.7	-9.0	84.4	14.5
Magenta	52.3	49.1	-10.0	2.6

From the experimental data it was determined that desirable coatings by fabric type are as follows: Cotton Poplin and Jersey Knit desirably use the coating described in Example 21 at about 13 % total solids; Silk Crepe de Chine and Charmeuse use the coating described in Example 36 at about 7 % total solids; Polyester Georgette uses the coating described in Example 30 at about 32 % total solids; Poly Satin and Poly Dacron use the previous coating (Example 30) at about 32 % total solids; and Poly Poplin uses the same coating at between about 20-25 % total solids.

If textile post treatment is desired (i.e. a heating step, such as steaming, oven heating, ironing, or other form of curative step) a still further alternate embodiment of the present invention relates to treatments/coating formulations and related methods for treating textile substrates which enhance the color brilliance, adhesion, and/or

09702093 - 20020220

waterfastness/detergentfastness of inkjet reactive dye, acid dye, and pigment based inks on textile fabric substrates, which utilizes an imbibing solution in conjunction with a substrate coating. For the purposes of this application, an imbibing solution shall mean a solution used to saturate a fabric such that it penetrates the interstitial spaces of the fabric. The coating solution (or treatment, as has earlier been described) itself may include the imbibing solution, or in the alternative, the coating solution and imbibing solution may be applied in separate application steps.

The treatment or coating formulations in the present invention consist primarily of cationic polymers, binders, fabric softeners, and other additives similar to those previously described. However, in conjunction with these coating formulations, an imbibing solution is used to further treat the fabric substrate. For example, in a first embodiment utilizing the imbibing solution with reactive ink sets, an imbibing solution consisting of either sodium bicarbonate or sodium carbonate and urea, (for added color brilliance with post-treatment) is used with a aqueous coated fabric treatment. The imbibing solution is desirably applied at a level of between about 5-20 % by weight, more desirably 5-10 % by weight, depending on fabric type, and by using a standard saturation/padding method. When the imbibing solution is made a part of the aqueous coating composition, desirably, the sodium bicarbonate, sodium carbonate, or combination is present in the imbibing/coating solution in an amount between about 3 and 10 percent of the total solids. Desirably, the urea is present in the combined imbibing/coating solution in an amount between about 5 and 12 percent of the total solids. Other additives may be included in the combined coating/imbibing solution such as wetting agents, and defoamers. If additives are present in the formulation, they are desirably present in an amount between about 0.1 and 1 percent of the total solids. For instance, the wetting agent Q2-511 may be included in the combined coating/imbibing solution. Optionally, dye fixatives may also be included in the coating formulation at less than about 5 % of the total solids.

When the imbibing solution is applied as a separate solution following the coating formulation application, the sodium bicarbonate/sodium carbonate is also desirably present in an amount between about 30 and 40 percent of the total solids. The urea is present in the separate imbibing solution in an amount between about 50 and 70 percent solids. When the imbibing solution is used as a separate solution from the coating formulation, it may also include a wetting agent in solution as well as other additives in the same amounts as the prior embodiment. Water is present in solution in an amount between about 10 and 90 percent of the solution. As has been stated, this imbibing solution embodiment is desirably used with the reactive colorant classes, including those

which may be applied via ink jet printing processes such as the monochlorotriazines and/or vinyl sulfones.

In a second embodiment utilizing an imbibing solution, the aqueous imbibing solution includes ammonium sulfate and urea for added color brilliance with post-treatment. As has been stated for the previous embodiment, the imbibing solution may be a part of the initial coating, or a separate solution. In this embodiment, the ammonium sulfate is desirably present in an amount between about 5 and 10 percent of the total solids, when used as part of the coating formulation. The urea is desirably present in the combined coating/imbibing solution in an amount of between about 2 and 5 percent of the total solids. When the imbibing solution is a separate solution from the coating solution, the ammonium sulfate is present in an amount of between about 30 and 40 percent of the total solids. The urea is present in this separate imbibing solution in an amount between about 50 and 70 percent of the total solids. Other additives may be included in the combined coating/imbibing solution such as wetting agents, surfactants and defoamers. For instance, the wetting agent Q2-5211 may be included in the combined coating/imbibing solution. Optionally, dye fixatives may also be included in the coating formulation at less than about 5 percent of the total solids. To reiterate, when the imbibing solution is used as a separate solution from the coating formulation, the solution also includes water and optionally wetting agents. The second embodiment is to be used with the acid dye class including those which may be applied via ink jet printing processes. The imbibing solution is desirably applied at a level of 5-20 % by weight, depending on fabric type, and by using a standard saturation/padding method. More desirably, the imbibing solution is applied at a level of 10-15 % by weight. It should be noted that when the imbibing solution for the above described embodiments are to be made separately from the coating formulation, they can either be mixed in a 50/50 ratio with the coating formulation to be applied simultaneously or in the alternative, the coating formulation can first be applied to the fabric, the fabric dried, and then the imbibing solution can be applied to the fabric and then dried.

Textile substrates for use with the treatment methods may include cotton, silk, linen, polyester, rayon, nylon, and blends thereof. Conventionally, reactive dyes are used for cotton substrates and acid dyes are used for silk and nylon substrates. However, because of the coating treatment and fixation treatment (imbibing solution) associated with it, the invention allows for the fixation of classes of dyes on substrates that they are not normally associated with, or which would not be done commercially because the fixation is not normally facile or efficient. As demonstrated by the set of examples which follow, the disclosed ink jet receptive substrates that have been further treated with an imbibing

09702093 - 102000

solution provide high color density and saturation, superior print quality, reduction of wicking or bleeding, and enhanced ink absorption. Furthermore, the coating or treatment formulations provide a color enhanced waterfast/detergentfast printed image when printed with an ink jet printing process with post-printing treatment steps, such as heating, steaming, chemical fixation, or radiation curing. With a conventional steaming process, minimal dye washout occurs, thus minimal dyewaste occurs.

This alternate embodiment of the present invention is further described by the set of examples which follow. Such examples, however, are not meant to be construed as limiting in any way either the spirit or the scope of the present invention.

EXAMPLE CONDITIONS:

A series of coatings were created including cationic polymers, fabric softeners, latex binders, other additives and water. The coatings are identified below with the respective content percentages. It should be noted that certain coatings included an imbibing solution within their formulation while others did not, and an imbibing solution was therefore utilized in a seperate application step. Batch sizes are expressed in grams.

First Coating (similar to that used in the previous Example 21), referred to as Types A, B & D in the examples which follow, for use with cotton fabrics

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE (GRAMS)
CP7091RV	49.30	18.50	37.53	18.01
AirFlex 540	55.17	37.00	67.07	32.19
PrintRite 591	43.50	37.00	85.06	40.83
Varisoft 475	10.00	7.40	74.00	35.52
Water			569.69	273.45
	12	100	833.33	400

3/6 R7

Separate Imbibing Solution referred to as Type C for use with cotton fabrics

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
Sodium Bicarbonate	63.40	3.00	4.73	22.70
Urea	95.00	5.00	5.26	30.81
Q2-5211	100.00	0.20	0.20	1.17
Water			58.34	341.49
	12	8.2	68.33	Approx. 400

The Dyeset concentrations (Polyamines), designated as Dyeset Conc. in the tables that follow, were obtained from Sybron Chemicals of Wellford, South Carolina, along with Dyeset NOZ and Dyeset NFS. Such materials are dye fixatives for reactive dyes. The Q2-5211 which is a wetting agent, was obtained from Dow Corning. The sodium bicarbonate can be obtained from VWR of Norcross, Georgia and Baker Chemical, and the Urea can be obtained from Baker Chemical.

The "Combo", which is a combination of a coating and imbibing solution, referred to in the examples which follow as Type E, for use with cotton fabrics.

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
CP709IRV	49.30	16.50	33.47	16.06
AirFlex 540	55.17	35.00	63.44	30.45
PrintRite 591	43.50	35.00	80.46	38.62
Varisoft 475	10.00	5.40	54.00	25.92
Sodium Bicarb	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Water			591.97	284.15
	12	100	833.33	400

Coating (similar to that of previous Example 21), referred to in the following examples as Type F, used for cotton fabrics

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
CP709IRV	49.30	17.50	35.50	17.04
AirFlex 540	55.17	36.00	65.25	31.32
PrintRite 591	43.50	36.00	82.76	39.72
Varisoft 475	10.00	7.40	74.00	35.52
Dyeset NOZ	12.20	3.00	24.59	11.80
Q2-5211	100.00	0.20	0.20	0.10
Water			551.23	264.59
	12	100	833.33	400

Coating, referred to in the examples that follow as Type G, used for cotton

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
CP709IRV	49.30	17.50	35.50	17.04
AirFlex 540	55.17	36.00	65.25	31.32
PrintRite 591	43.50	36.00	82.76	39.72
Varisoft 475	10.00	7.40	74.00	35.52
Dyeset NFS	36.70	3.00	8.17	3.92
Q2-5211	100.00	0.20	0.20	0.10
Water			567.65	272.47
	12	100	833.33	400

Coating, referred to in the following examples as Type H for cotton fabrics.

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
CP709IRV	49.30	17.50	35.50	17.04
AirFlex 540	55.17	36.00	65.25	31.32
PrintRite 591	43.50	36.00	82.76	39.72
Varisoft475	10.00	7.40	74.00	35.52
Dyeset Conc.	47.60	3.00	6.30	3.03
Q2-5211	100.00	0.20	0.20	0.10
Water			569.52	273.37
	12	100	833.33	400

09720093 - 15260T

37 129

Coating, referred to in the following examples as Type I for cotton fabrics

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
CP7091RV	49.30	15.50	31.44	15.09
AirFlex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset Conc	47.80	3.00	6.30	3.03
Sodium Bicarb	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Water			591.81	284.07
	12	100	833.33	400

Coating, referred to in the examples that follow as Type J for cotton fabrics.

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
CP7091 RV	49.30	15.50	31.44	15.09
AirFlex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset NOZ	12.20	3.00	24.59	11.80
Sodium Bicarb	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Water			573.52	275.29
	12	100	833.33	400

0097020093 - 1030000

Coating referred to in the following examples as Type K for cotton fabrics.

ORDER OF ADDITION INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
CP7091RV	49.30	15.50	31.44	15.09
AirFlex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset NFS	38.70	3.00	8.17	3.92
Sodium Bicarb	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Water			589.94	283.17
	12	100	833.33	400

It should be noted that the above coatings can be used on a variety of textiles including silk and nylon. Additionally, the following coating can be used for Nylon/Lycra and silk substrates when using acid dyes.

Coating, used for Nylon/Lycra and silk fabrics with acid dyes sets

ORDER OF ADDITION OF INGREDIENTS	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
5 Reten 204LS	17.95	25.00	139.28	452.62
2 AirFlex 540	55.27	100.00	181.26	589.06
3 VS475	10.00	20.00	200.00	649.97
4 Q2-5211	100.00	2.70	2.70	8.77
	1.00	0.00	0.00	0.00
	1.00	0.00	0.00	0.00
1 water			707.60	2299.58
	12	147.7	1230.83	4000

The coating and imbibing solution may be poured together as described below. The separate acid dye fixation formula (imbibing solution, without coating solution) includes deionized water in the range of about 30-90 %, but more desirably at about 83 weight percentage, ammonium sulfate in the range of about 30 to 40 total solids percent, urea in

DOCKET: 15280297

the range of about 50 to 70 solids percent, and an optional surfactant in the range of about 0.1-1.0, such as, Surfynol 465 at about 0.2 weight percent. The acid dye fixation formula described above (acid imbibing solution) is used with a particular coating, such as coatings described to be similar to preliminary Example 21 (described in the reactive dye section) or the coating listed immediately above, by being poured into the coating in a 50/50 ratio and then applied to the substrate as previously described, as opposed to being applied in a separate application step. For the silk substrate in particular, the coating used was combined in a 50/50 ratio with the acid imbibing solution. Alternatively, the coating and imbibing solution can be combined, such as in the formulation described below.

Coating, used for Nylon/Lycra and silk fabric substrates, with acid dyes sets, including both preliminary coating and imbibing solution

ORDER OF ADDITION OF INGREDIENTS NOTED BY NUMBER	% TOTAL SOLIDS	DRY PARTS	WET PARTS	BATCH SIZE
7 CP7091RV	49.3	15.5	31.4	19.51
4 Airflex 540	55.17	34	61.6	38.25
6 PrintRite 591	43.5	34	78.2	48.51
5 Varisoft 475	10	20.4	204.0	126.62
3 Ammonium Sulfate	100	7	7.0	4.34
2 Urea	95	5	5.3	3.27
1 Water			584.4	362.75
	12.00	116	966.67	600

Reactive Dye Examples

Example 1

In this and the following examples, 11 by 15 inch fabric samples were evaluated. In example 1, the samples were first coated and then imbibed. In particular, the fabric was first coated through a dip and nip procedure/padding as has been previously described, using coating A and then dried in a forced air oven at 100°C for 30 seconds. Following this step the fabric sample was imbibed in a dip and nip/padding method using imbibing solution C and dried again in the oven at 100°C for 30 seconds. For each example (except where otherwise noted) four fabric sample sheets were tested. In order to achieve good hand attributes, the goal for percent dry pickup was between 7 and 9. The percent

dry pickup was calculated in accordance with the following series of equations. These equations are described in Wellington Sears Handbook of Industrial Textiles, by Sabit Adanur, PH.D.copyright 1995, p.179.

$$\text{Wet pickup (\%)} = \frac{\text{Weight of formulation picked up}}{\text{Weight of dry fabric}} \times 100$$

$$\text{Add-on (\%)} = \text{Concentration of Formulation (\%)} \times \text{Wet Pickup (\%)}$$

From this the following equation was utilized to arrive at the values in the charts for % dry-pickup.

$$\text{\% Dry Pickup} = ((\text{Wet/Basis Weight}) \times 100) - 100 \times \text{\% Solids (TS)}$$

Results of Example 1

OBJECTIVE: TO IMBIBE COTTON POPLIN FABRIC USING TYPE A COATING AND SEPARATE IMBIBING SOLUTION. T.S.• OF 11.6 IN PERCENT			
#	BW Dry In gms/m²	Wet weight In grams	% Pickup Dry
1	14.1	24.29	8.4
2	14.1	24.21	8.4
3	14.3	24.74	8.5
4	14.3	25.28	9.0

•T.S. represents total solids (percent), BW represents basis weight.

133

Example 2

In this example fabric samples were imbibed first using imbibing solution Type C and then coated with Coating Type B using the procedures described in previous Example 1.

OBJECTIVE: TO IMBIBE COTTON POPLIN USING TYPE B WITH T.S. 11.6/T.S. 10.6						
	Imbibing Step T.S. 11.6			Coating Step T.S. 10.6		
SAMPLE #	BW in grms/m²	Wet weight in grms	% Dry Pickup	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.85	22.71	12.6	12.42	22.20	8.4
2	10.67	22.86	12.7	12.38	21.35	7.7
3	10.8	22.16	12.2	12.34	22.22	8.5
4	10.9	22.46	12.3	11.74	20.94	8.3

Example 3

In this example fabric samples were imbibed only with solution Type C.

OBJECTIVE: TO IMBIBE COTTON POPLIN WITH SOLUTION TYPE C WITH T.S. OF 12			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.83	21.92	11.8
2	10.58	21.63	12.1
3	9.69	19.75	12.1
4	9.7	20.6	12.9

Example 4

In this example fabric samples were coated only with Type D coating.

OBJECTIVE: TO COAT FABRIC SAMPLES ONLY WITH TYPE D/ T.S. 10.6.			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	9.73	18.46	9.5
2	9.84	18.54	9.3
3	10.73	20.79	9.9
4	10.76	20.93	10.1

09702092 - 120000

Example 5

In this example fabric samples were coated with the Combo Type E solution.

OBJECTIVE: TO TREAT FABRICS WITH THE COMBO SOLUTION/T.S. 11.4, TYPE E			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.97	21.14	10.6
2	10.74	20.47	10.3
3	10.75	20.62	10.5

Example 6

In this example fabric samples were coated with Type F coating.

OBJECTIVE: TYPE F COATING; DYESET NOZ AND T.S. 11.1			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.84	21.7	11.1
2	11.02	21.29	10.3
3	10.87	21.26	10.7

Example 7

In this example fabric samples were treated with Type G coating.

OBJECTIVE: TYPE G /DYESET NFS AND T.S. 11.68			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.84	21.1	11.1
2	10.85	20.7	10.6
3	10.77	20.7	10.8

Example 8

In this example fabric samples were treated with Type H coating.

OBJECTIVE: TYPE H /DYESET CONC T.S. 11.2			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.86	21.1	10.5
2	10.86	21.3	10.6
3	10.86	20.8	10.4

09702092 "20020200

Example 9

In this example fabric samples were treated with Type I coating.

OBJECTIVE: TYPE I /CONC T.S. 11.4			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.6	20.9	11.1
2	10.9	21.4	10.9
3	10.8	21.2	10.9

Example 10

In this example fabric samples were treated with Type J coating.

OBJECTIVE: TYPE J / NOZ/T.S. 11			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.98	21.4	10.5
2	10.78	21.2	10.6
3	10.72	20.73	10.2

Example 11

In this example fabric samples were treated with Type K coating.

OBJECTIVE: TYPE K /NFS			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	12.2	24.1	11.7
2	12.2	23.8	11.4
3	10.7	20.8	11.3

Reactive Dye Example Results

Each of the samples were exposed on half of their area to D65/ 10° illuminant (standard day light) to determine whether any yellowing occurs. A sample of each was also printed using the TX-1500 printer of Encad and a reactive ink set available from Kimberly-Clark Printing Technology, Inc. of Escondido, California under the designations 17960-17970. Prior to printing, the fabric sample was first laminated to a backing as has been previously described in the first example set. Examples of reactive dyes used included reactive blue 49 and black 5 available from companies such as DyStar and BASF corporation. The reactive dye sets utilize vinyl sulfones and monochlorotriazines.

136

Since reactive dyes are typically not ink-jetted because of the level of particulates and other salt components in the dyes, a reactive dye set was developed for testing with the coatings. It is surmised that other reactive dye sets could also be used in conjunction with the coatings, such as those dyes available from Cibe. The dyed samples were dried overnight in the dark.

00136

Type A was demonstrated to work well only after it had been steamed. Exposing Type A to a water wash was acceptable before steaming but detergent wash demonstrated considerable washout. Type B was demonstrated to work well without steaming but had some redepositing problems onto the fabric. Type C was demonstrated as having the most washout of all samples tested without steaming and having a visually impaired appearance. After steaming the results for Type C were very much improved. Type D demonstrated positive results across all samples but failed the water spot test and printed samples. Only after washing and/or after steam and washing did Type D sample pass water spot testing. Type E demonstrated very acceptable results with water spotting occurring on printed sample only. Type E demonstrated poor results in detergent washing with no post processing steps. Type F demonstrated positive visual appearances as did Type H samples. Type G samples failed most testing. Types I, J and K each demonstrated relatively the same positive results, although type K was shown to be a better performer in terms of appearance and washability.

09720209 "EP0020690

For the purposes of this application the water spot test comprised AATTC Test Method 104-1994. Essentially in this test, a drop of water is placed on a substrate and then rubbed down using a glass rod. The substrate is then observed to see if a water spot remains after the water dries. If a white circle appears then a water spot is considered to have been left.

Other reactive dye ink sets may be used with these coatings including those available from Kimberly-Clark Printing Technology, Inc. under the designations, TXCR-500 Black, TXCR-520 Red, TXCR-523 Medium Red, TXCR-526 Scarlet, TXCR-530 Orange, TXCR-540 Yellow, TXCR-545 Golden Yellow, TXCR-550 Green, TXCR-560 Turquoise, TXCR-565 Medium Turquoise, TXCR-570 Blue, and TXCR-580 Gray. These reactive dye ink sets were tested with the above coatings by printing them through a Colorspan DM XII 12-color printer/ 600 dpi.

Alternatively, instead of using reactive dye sets, acid dye ink sets may be used with acid dye fixation solutions (imbibing solutions). Textile substrates which can use the acid dye sets include ones such as those with fibers that are dyeable with acid dyes, blended yarns, as long as the ratio is at least 15% between nylon and other material such as Lycra, and polyamides. Such acid dye sets are available from Kimberly-Clark Printing

Technology, Inc. under the designation 17972-17975. Additional acid dye sets are available from Kimberly-Clark Printing Technology, Inc. under the designations 7287-20-2 Black, 7287-27-2 Gray, 6869-184-5 Violet, 7287-21-1 Blue, 7287-24-2 Lt. Blue, 7287-10-1 Turquoise, and 7287-25-1 Green, 6869-186-3B Magenta, 7287-24-1 Lt. Magenta, 6869-184-10 Scarlet, 7287-15-1 Orange, 7287-6-1 Yellow. Such inks were tested with the above described coatings using the Colorspan DM XII printer previously described.

By using such dye sets, an inkjet solution to a conventional screen printing process using acid dyes and a treated substrate is provided. Providing a digital alternative to this market will greatly reduce the cost for the manufacturing of textiles and will allow for more custom-made products to be produced.

Acid Dye Examples

A coated and imbibed nylon fabric was prepared in a similar fashion to the fabric samples previously described, and printed with a test print on the dried sample. The sample was washed in hot water with no apparent dye washout.

In a second set of examples, acid dye sets were used on silk charmeuse and on Nylon/Lycra fabric samples. As in the prior examples, fabric sheet swatches of 11 by 15 inches were cut of the fabric, and the fabric was then tested in accordance with various test coatings. It should be noted that these fabrics can not be printed on directly while uncoated. The results for just washing demonstrates a Delta E of 40 for nylon/Lycra and a Delta E of 35 for the silk charmeuse without post treatment. However, following post treatment for coated fabrics the Delta E values for both were about 1.5 or less. Post treatment consisted of steaming, and in particular, steaming the fabrics at between about 105° C to 125° C, approximately 25 minutes for silk and 45 minutes for nylon/lycra. Silk data is described in the following Table 7.

47
138
00133

Table 7

ACID INKS ON SILK, USING KIMBERLY-CLARK PRINTING TECH. INKS (COLOR)	STEAMED DELTA E	STEAMED AND WASHED DELTA E
Yellow	8.9	0.5
Orange	7.1	0.5
Scarlet	17.2	1.5
Med. Scarlet	8.3	2.4
Magenta	19.2	1.5
Green	6.2	1.3
Med. Trq.	4.1	1.5
Trq.	4.9	0.7
Blue	5.3	1.9
Violet	6.6	0.8
Grey	3.4	1.2
Black	4.5	0.4

DOCKET: 15260093 - 092502

Pigment Ink Examples

It should also be recognized that Pigmented Ink Formulations may also be used in conjunction with the coating and imbibing solution formulations. It is particularly desirable to use Pigmented Ink formulations available from Kimberly-Clark Printing Technology, Inc. under the designations 17976-17979. Examples of the pigment dispersions include Acryjet Cyan, majenta, yellow and black available from the Rhom and Haas Corporation.

The coating/ treatment formulations and methods which are the subject of this invention, provide ink jet printable textile substrates which possess characteristics of print and image quality, a noticeable color enhancement, color quality and density, ink retention capacity, and waterfastness and detergentfastness properties. Such formulations can be used to prepare articles of manufacture as previously described.

While the invention has been described in detail with particular reference to a preferred embodiment thereof, it should be understood that many modifications, additions, and deletions can be made thereto without departure from the spirit and the scope of the invention as set forth in the following claims.

1210

CLAIMS

What is claimed is:

00140

1. An aqueous coating formulation containing solids, for enhancing image visualization and retention of reactive dye-based inks, comprising:
   a) a cationic polymer or copolymer,
   b) a fabric softener,
   c) urea, and
   d) an ingredient selected from sodium bicarbonate, sodium carbonate or combinations thereof.

2. The aqueous coating formulation of claim 1 wherein said cationic polymer or copolymer is present in an amount between about 5 to 95 % of the total solids.

3. The aqueous coating formulation of claim 1 wherein said fabric softener is present in an amount between about 5 to 20 % of the total solids.

4. The aqueous coating formulation of claim 1 further comprising a latex binder.

5. The aqueous coating formulation of claim 4 wherein said latex binder is present in an amount between about 0 to 80 % of the total solids.

6. The aqueous coating formulation of claim 1 wherein the sodium bicarbonate, sodium carbonate or combination thereof is present in an amount between about 3 and 10 % of the total solids.

7. The aqueous coating formulation of claim 1 wherein the urea is present in an amount between about 5 and 12 % of the total solids.

8. The aqueous coating formulation of claim 1 further including additives selected from the group including wetting agents, defoamers, and surfactants.

9. The aqueous coating formulation of claim 8 wherein said additives are present in an amount between about 0.1 and 1 % of the total solids.

09702092 .10300

141

10. An aqueous imbibing solution, for enhancing image visualization and retention of reactive dye-based inks comprising:
    a) either sodium bicarbonate, sodium carbonate, or a combination thereof,
    b) urea.

00141

11. The aqueous imbibing solution of claim 10 wherein either the sodium bicarbonate, sodium carbonate, or combination thereof is present in an amount of between about 30 and 40 % of the total solids.

12. The aqueous imbibing solution of claim 10 wherein said urea is present in an amount of between about 50 and 70 % of the total solids.

09702093 = 20020207

13. The aqueous imbibing solution of claim 10 further including additives selected from the group including wetting agents, defoamers, and surfactants.

14. An aqueous coating formulation containing solids, for enhancing image visualization and retention of acid dye-based inks, comprising:
    a) a cationic polymer or copolymer,
    b) a fabric softener,
    c) urea, and
    d) ammonium sulfate.

15. The aqueous coating formulation of claim 14 wherein said cationic polymer or copolymer is present in an amount between about 5 to 95 % of the total solids.

16. The aqueous coating formulation of claim 14 wherein said fabric softener is present in an amount between about 5 to 20 % of the total solids.

17. The aqueous coating formulation of claim 14 further comprising a latex binder.

18. The aqueous coating formulation of claim 17 wherein said latex binder is present in an amount between about 0 to 80 % of the total solids.

19. The aqueous coating formulation of claim 14 wherein the urea is present in an amount between about 2 and 5% of the total solids.

00142

20. The aqueous coating formulation of claim 14 wherein the ammonium sulfate is present in an amount between about 5 and 10 % of the total solids.

21. The aqueous coating formulation of claim 14 further including additives selected from the group including wetting agents, defoamers, and surfactants.

22. The aqueous coating formulation of claim 21 wherein said additives are present in an amount between about 0.1 and 1 % of the total solids.

23. An aqueous imbibing solution, for enhancing image visualization and retention of acid dye-based inks comprising:

    a) ammonium sulfate,
    b) urea.

24. The aqueous imbibing solution of claim 23 wherein said ammonium sulfate is present between about 30 and 40% of the total solids.

25. The aqueous imbibing solution of claim 23 wherein said urea is present in an amount of between about 60 and 70 % of the total solids.

26. The aqueous imbibing solution of claim 23 further including additives selected from the group including wetting agents, defoamers, and surfactants.

27. A method of treating a substrate so as to improve the adhesion, colorfastness and washfastness of a reactive dye-based ink jet ink printed onto the substrate, which will be exposed to a post-treatment step following printing, the method comprising the steps of:

    a) providing a substrate,
    b) treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, a fabric softener, urea, and an ingredient selected from sodium bicarbonate, sodium carbonate or combinations thereof.

28. The method of claim 27 wherein said cationic polymer or copolymer is present in said aqueous coating formulation in an amount between about 5 to 95 % of the total solids.

143

29. The method of claim 27 wherein said fabric softener is present in said aqueous coating formulation in an amount between about 5 to 20 % of the total solids.

30. The method of claim 27 wherein said aqueous coating formulation further includes a latex binder.

00143

31. The method of claim 30 wherein said latex binder is present in said aqueous coating formulation in an amount between about 0 to 80 % of the total solids.

32. The method of claim 27 wherein said urea is present in said aqueous coating formulation in an amount between about 5 to 12 % of the total solids.

33. The method of claim 27 wherein said sodium bicarbonate, sodium carbonate or combinations thereof is present in said aqueous coating formulation in an amount between about 3 to 10 % of the total solids.

34. An article produced by the method of claim 27.

35. A method of producing a printed substrate so as to improve the adhesion, colorfastness and washfastness of a reactive dye-based ink jet ink printed onto the substrate, the method comprising the steps of:
    a) providing a substrate,
    b) treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, a fabric softener, urea, and an ingredient selected from sodium bicarbonate, sodium carbonate or combinations thereof,
    c) drying the substrate,
    d) printing on the substrate with a reactive dye-based ink,
    e) post-treating the printed substrate of step d).

36. A method of treating a substrate so as to improve the adhesion, colorfastness and washfastness of a reactive dye-based ink jet ink printed onto the substrate, which will be exposed to a post-treatment step following printing, the method comprising the steps of:

    a) providing a substrate,
    b) treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, and a fabric softener,
    c) treating the substrate of step b) with an aqueous imbibing solution of urea, and an ingredient selected from sodium bicarbonate, sodium carbonate or combinations thereof.

37. An article produced by the method of claim 36.

38. A method of producing a printed substrate so as to improve the adhesion, colorfastness and washfastness of a reactive dye-based ink jet ink printed onto the substrate, the method comprising the steps of:

    a) providing a substrate,
    b) treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, a fabric softener,
    c) treating the substrate of step b) with an imbibing aqueous solution of urea, and an ingredient selected from sodium bicarbonate, sodium carbonate or combinations thereof,
    d) drying the substrate,
    e) printing on the substrate with a reactive dye-based ink, and
    f) post treating the printed substrate of step e).

39. A printed substrate produced in accordance with the method of claim 35.

40. A printed substrate produced in accordance with the method of claim 38.

41. A method of treating a substrate so as to improve the adhesion, colorfastness and washfastness of an acid dye-based ink jet ink printed onto the substrate, and which substrate will be exposed to a post-treatment step following printing, the method comprising the steps of:
    a) providing a substrate,
    b) treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, a fabric softener, urea, and ammonium sulfate.

42. The method of claim 41 wherein said cationic polymer or copolymer is present in an amount between about 5 to 95 % of the total solids.

43. The method of claim 41 wherein said fabric softener is present in an amount between about 5 to 20 % of the total solids.

44. The method of claim 41 wherein the aqueous coating formulation further comprises a latex binder.

45. The method of claim 44 wherein said latex binder is present in an amount between about 0 to 80 % of the total solids.

46. The method of claim 41 wherein the urea is present in an amount between about 2 and 5 % of the total solids.

47. The method of claim 41 wherein the ammonium sulfate is present in an amount between about 5 and 10 % of the total solids.

48. An article produced by the method of claim 41.

49. A method of treating a substrate so as to improve the adhesion, colorfastness and washfastness of an acid dye-based ink jet ink printed onto the substrate, which will be exposed to a post-treatment step following printing, the method comprising the steps of:

    a) providing a substrate,
    b) treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, and a fabric softener,
    c) treating the substrate of step b) with an aqueous imbibing solution of urea, and ammonium sulfate.

50. A method of producing a printed substrate so as to improve the adhesion, colorfastness and washfastness of an acid dye-based ink jet ink printed onto the substrate, the method comprising the steps of:

    a) providing a substrate,
    b) treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, a fabric softener, urea, and ammonium sulfate,
    c) drying the substrate,
    d) printing on the substrate with a reactive dye-based ink,
    e) post-treating the printed substrate of step d).

51. A printed substrate produced in accordance with the method of claim 50.

52. A method of producing a printed substrate so as to improve the adhesion, colorfastness and washfastness of an acid dye-based ink jet ink printed onto the substrate, the method comprising the steps of:

    a) providing a substrate,
    b) treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, a fabric softener,
    c) treating the substrate of step b) with an imbibing aqueous solution of urea, and an ingredient selected from sodium bicarbonate, sodium carbonate or combinations thereof,
    d) drying the substrate,
    e) printing on the substrate with a reactive dye-based ink, and
    f) post treating the printed substrate of step e).

09702093 - 100200

53. A printed substrate produced in accordance with the method of claim 52.

0997020923 - 100200

148

Abstract

A method of producing a printed substrate so as to improve the adhesion, colorfastness and washfastness of either reactive or acid dye-based ink jet inks printed onto the substrate, the method includes the steps of providing a substrate, treating the substrate with an aqueous coating formulation comprising a cationic polymer or copolymer, a fabric softener, treating the substrate of step with an imbibing aqueous solution of either urea, and an ingredient selected from sodium bicarbonate, sodium carbonate or combinations thereof, or ammonium sulfate, drying the substrate, printing on the substrate with either an acid or reactive dye-based ink, depending on the coating and post treating the printed substrate.

148

09702093 .103000

In the United States Patent and Trademark Office

149

Applicants:	Alison Salyer Bagwell et al.	Docket No.:	15260
Serial No.:		Group:	
Filed:	October 30, 2000	Examiner:	
For:	COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM		

Combined Declaration and Power of Attorney
Utility U.S. Patent Application
Joint Inventors

ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

Sir:

As the below-named inventors, we hereby declare that:

Our respective residence addresses, post office addresses and citizenship designations are as stated below, next to our names.

We believe that we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought in the patent application entitled:

COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM

the specification of which is attached hereto.

We hereby state that each of us has reviewed and understands the contents of the above-identified specification, including the claims and any accompanying drawings as amended by any amendment specifically referred to in the oath or declaration.

We acknowledge our duty to disclose all information which is material to the patentability of this application as defined by 37, C.F.R. 1.56.

We hereby claim the benefit under 35 U.S.C. section 119(E) of any United States provisional application(s) listed below.

60/163,741 – Application Number November 4, 1999 – Filing Date

54

150

As the named inventors, we hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the U.S. Patent and Trademark Office connected herewith:

Michael J. Bendel, Reg. No. 39605; Patricia A. Charlier, Reg. No. 38840; Thomas J. Connelly, Reg. No. 28404; Gregory E. Croft, Reg. No. 27542; Jeffrey B. Curtin, Reg. No. 37601; Alyssa A. Dudkowski, Reg. No. 40598; Jeremiah J. Duggan, Reg. No. 24470; Steven D. Flack, Reg. No. 40608; Thomas M. Gage, Reg. No. 33385; Scott B. Garrison, Reg. No. 39,198; Joseph P. Harps, Reg. No. 28854; William D. Herrick, Reg. No. 25468; Kyle K. Kappes, Reg. No. 34846; John P. Kirby, Jr., Reg. No. 25348; Nancy M. Klembus, Reg. No. 40051; Christos S. Kyrtakou, Reg. No. 42776; Nicholas N. Leach, Reg. No. 31776; William W. Letson, Reg. No. 42797; Thomas J. Mielke, Reg. No. 31399; Douglas L. Miller, Reg. No. 30406; Thomas M. Parker, Reg. No. 42063; Sebastian C. Pugliese III, Reg. No. 42091; James B. Robinson, Reg. No. 34912; Karl V. Sidor, Reg. No. 32597; Douglas H. Tuley, Reg. No. 34743; Patrick C. Wilson, Reg. No. 31893; and Paul Y. Yee, Reg. No. 29460.

Please send all correspondence to Steven D. Flack, Esq., Kimberly-Clark Worldwide, Inc., 401 North Lake Street, Neenah, Wisconsin 54956.

Our representative may be reached at: (770) 587-8648.

We hereby declare that:

1. All statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and

2. These statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

First Named Inventor's Full Name:	Alison Salyer Bagwell
First Named Inventor's Signature:	_____
Date of Execution of this Document by First Named Inventor:	Date: _____
First Named Inventor's Country of Citizenship:	United States of America
First Named Inventor's Residence Address:	4310 Wellington Place Cumming, GA 30040
First Named Inventor's Post Office Address:	Same as Residence Address
Second Named Inventor's Full Name:	Kelly Dean Branham
Second Named Inventor's Signature:	_____
Date of Execution of this Document by Second Named Inventor:	Date: _____
Second Named Inventor's Country of Citizenship:	United States of America
Second Named Inventor's Residence Address:	6661 Cross Road Winneconne, WI 54986
Second Named Inventor's Post Office Address:	Same as Residence Address

09702093 - 030000

Third Named Inventor's Full Name:	Mary Elizabeth Farris
Third Named Inventor's Signature:	
Date of Execution of this Document by Third Named Inventor:	Date: _____
Third Named Inventor's Country of Citizenship:	United States of America
Third Named Inventor's Residence Address:	5475 Memphis Street Cumming, GA 30040
Third Named Inventor's Post Office Address:	Same as Residence Address
Fourth Named Inventor's Full Name:	Leonard Eugene Zelazoski
Fourth Named Inventor's Signature:	
Date of Execution of this Document by Fourth Named Inventor:	Date: _____
Fourth Named Inventor's Country of Citizenship:	United States of America
Fourth Named Inventor's Residence Address:	3785 Junction Drive Kennesaw, GA 30144
Fourth Named Inventor's Post Office Address:	Same as Residence Address

DOCKET: 2600209

PATENT

In the United States Patent and Trademark Office

In re application of:	Alison Salyer Bagwell et al.	Docket No.:	15280
Serial No.:		Examiner:	
Filed:	October 30, 2000	Group No.:	
For:	COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM	Date:	October 30, 2000

LETTER

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This application is being filed without a signed Declaration or Oath or an Assignment by the Applicant(s). A Combined Declaration and Power of Attorney and an Assignment will be submitted after Applicant(s) have received a "Notice to File Missing Parts of Application."

Respectfully submitted,

KIMBERLY-CLARK WORLDWIDE, INC.
401 North Lake Street
Neenah, Wisconsin 54956

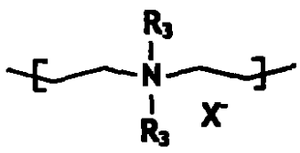
Steven D. Flack
Registration No. 40,808
Telephone: (770) 587-8648

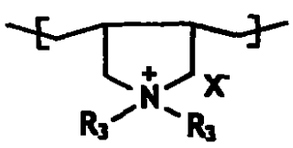
CERTIFICATE OF MAILING (37 C.F.R. 1.8a)

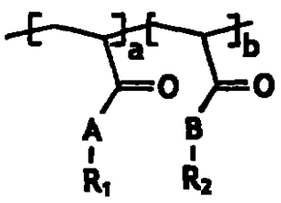
I, Steven D. Flack, hereby certify that on October 30, 2000, this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service, postage prepaid, Express Mail No. EL186515981US, in an envelope addressed to the Box Patent Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

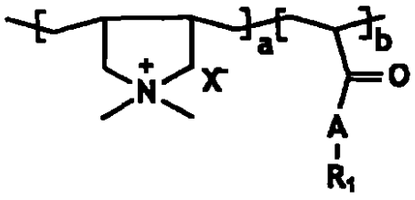
By: _____
Steven D. Flack

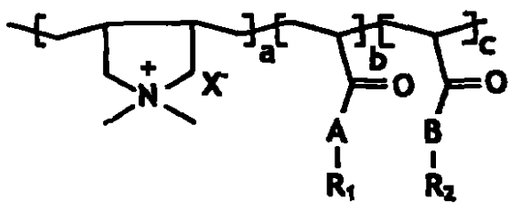
09720209 - 20020780











A, B= O, NH, N—

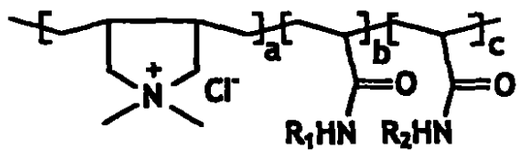
R_1, R_2= quaternary ammonium, hydrophilic, hydrophobic, reactive, or self condensing group

R_3= H, alkyl, or alkoxy group

X= halogen or other counter ion

FIG. 1A

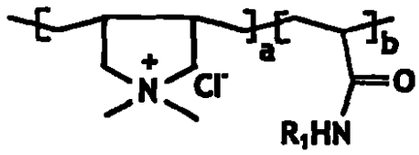
09702092 :20020207



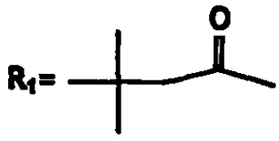
a= 1 to 99%, b= (100-a)%, c= 0 to 100-(a+b)%

R1, R2 - as above

FIG. 1B



a= 1 to 99%, b= (100-a)%



for CP 7091 RV, a~90; b~10

FIG. 1C

FIG. 2

156

TRADUCCIÓN DEL INGLÉS AL CASTELLANO de la Solicitud de Patente de los Estados Unidos No.09/702,093 relacionada con:

RECUBRIMIENTO PARA TRATAR SUSTRATOS PARA IMPRESIÓN CON INYECCIÓN DE TINTA INCLUYENDO SOLUCIÓN DE EMBEBIDO PARA VISUALIZACIÓN Y RETENCIÓN DE IMAGEN MEJORADAS, MÉTODO PARA TRATARLOS, Y ARTÍCULOS PRODUCIDOS A PARTIR DE ELLOS

00167

ANEXOS. La Solicitud de Patente de los Estados Unidos Serie No.09/ 702,093 arriba mencionada, Declaración y Poder, Solicitud de Patente, Certificación del Comisionado de Patentes y Marcas de los Estados Unidos de América; Certificación Notarial del Estado de Wisconsin, Estados Unidos de América.

LOS ESTADOS UNIDOS DE AMÉRICA

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS DE AMÉRICA

Oficina de Patentes y Marcas de los Estados Unidos

Enero 05, 2001

ESTE PARA CERTIFICAR QUE ANEXO AL PRESENTE SE ENCUENTRA UNA FIEL COPIA TOMADA DE LOS REGISTROS DE LA OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS DE AQUELLOS DOCUMENTOS DE LA SOLICITUD DE PATENTE IDENTIFICADA ABAJO LA CUAL CUMPLE LOS REQUISITOS PARA CONCEDERLE UNA FECHA DE PRESENTACIÓN BAJO LA NORMA 35USC 111.

NUMERO DE SOLICITUD: 09/702,093
FECHA DE PRESENTACION: Octubre 30, 2000

Por autorización del
COMISIONADO DE PATENTES Y MARCAS
T. Lawrence (Firmado)
T. LAWRENCE
Funcionari de Certificaciones

SELLO ADHERIDO

Caso # 15260
COLOMBIA

CERTIFICACIÓN

ESTADO DE WISCONSIN)
) SS
CONDADO DE WINNEBAGO)

Certifico por este medio que el documento anexo constituye una copia idéntica del original de la Solicitud de Patente de los Estados Unidos Serie No. **09/702,093** para **RECUBRIMIENTO PARA TRATAR SUSTRATOS PARA IMPRESIÓN CON INYECCIÓN DE TINTA INCLUYENDO SOLUCIÓN DE EMBEBIDO PARA VISUALIZACIÓN Y RETENCIÓN DE IMAGEN MEJORADAS, MÉTODO PARA TRATARLOS, Y ARTÍCULOS PRODUCIDOS A PARTIR DE ELLOS**, presentada en **Octubre 30, 2000**, cedida a Kimberly-Clark Worldwide, Inc. y adicionalmente certifico que Kimberly-Clark Worldwide, Inc. es una corporación organizada y existente bajo las leyes del Estado de Delaware, Estados Unidos de América.

Fechada este 22 día de Febrero, 2001, en Neenah, Wisconsin, Estados Unidos de América.

Melissa A. Blob (firmado)

Melissa A. Blob, Notario Público
Mi Comisión Expira: Agosto 1, 2004

(Sin Legalización)

RECUBRIMIENTO PARA TRATAR SUSTRATOS PARA IMPRESIÓN CON INYECCIÓN DE TINTA INCLUYENDO SOLUCIÓN DE EMBEBIDO PARA VISUALIZACIÓN Y RETENCIÓN DE IMAGEN MEJORADAS, MÉTODO PARA TRATAR DICHOS SUSTRATOS, Y ARTÍCULOS PRODUCIDOS A PARTIR DE ELLOS

Campo de la Invención

La presente invención se relaciona con recubrimientos para tratar sustratos imprimibles con inyección de tinta destinados a recibir imágenes cuando se imprimen con dispositivos de impresión de

inyección de tinta. En particular, la presente invención se refiere a recubrimientos para tratar sustratos textiles para impresión de inyección de tinta, métodos para tratar dichos sustratos y artículos producidos a partir de ellos. Dichos métodos facilitan el empleo de aquellos sustratos en dispositivos de impresión láser o de inyección de tinta disponibles usualmente, tales como impresoras láser y de inyección de tinta en formato ancho o angosto.

Antecedentes de la Invención

La impresión de inyección de tinta es un método de impresión sin impacto y sin contacto en el cual una señal electrónica controla y dirige gotitas o una corriente de tinta que pueden depositarse sobre una amplia variedad de sustratos. La impresión de inyección de tinta es sumamente versátil en términos de la variedad de sustratos que pueden tratarse, así como de la calidad de impresión y la velocidad de operación que pueden obtenerse. Además, la impresión de inyección de tinta es controlable digitalmente. Por estas razones, la metodología de inyección de tinta ha sido ampliamente adoptada para marcación y etiquetado industrial. Adicionalmente, la metodología de inyección de tinta ha encontrado también un empleo generalizado en aplicaciones de diseño arquitectónico y de ingeniería, creación de imágenes médicas, trabajos de impresión en oficinas (tanto de texto como de gráficos), sistemas de formación de imágenes geográficas (por ejemplo, análisis y mapeo de datos sísmicos), rotulación, en gráficos de despliegue visual (por ejemplo, reproducción fotográfica, gráficas para salas de junta y las cortes, artes gráficas) y similares. Finalmente, la impresión de inyección de tinta se ha utilizado actualmente para crear una imagen sobre una variedad de sustratos textiles. El uso de la impresión de inyección de tinta para crear una imagen sobre telas textiles ha permitido la rápida visualización de un diseño estético sobre tela sin la utilización de técnicas de impresión de pantalla costosas y a menudo con gran incidencia de desechos. Dicha metodología de impresión de inyección de tinta le permite a un diseñador o planta de producción visualizar un diseño terminado en menos tiempo significativamente del usualmente necesario para quemar una imagen de pantalla del diseño por la metodología típica de impresión de pantalla.

Los tintes y pigmentos se han usado como colorantes para dichas formulaciones de tinta de inyección de tinta. No obstante, dichos materiales no siempre se adhieren bien a los sustratos a los cuales se aplica la tinta. Por ejemplo, los tintes pueden disolverse al contacto de un sustrato con el agua. De este modo las imágenes aplicadas, que emplean metodología de inyección de tinta, pueden tender a correrse o manchar al contacto repetido, o pueden removerse realmente de la superficie impresa si se exponen a cantidades sustanciales de medios

acuosos (por ejemplo, si se lava un artículo impreso con inyección de tinta). Más aún, las imágenes aplicadas empleando metodología de inyección de tinta pueden tender también a desvanecerse o desteñirse mediante la exposición prolongada a luz visible, ultravioleta y/o infrarroja. Aún más, los tintes aplicados a sustratos textiles pueden experimentar un flujo capilar serio del tinte en la aplicación al sustrato. Finalmente, la intensidad del color de la imagen impresa sobre un sustrato textil empleando metodología de inyección de tinta carece a menudo de vigor.

La naturaleza de los sustratos textiles plantea además problemas específicos cuando se imprimen o crean imágenes por medio de métodos de impresión de inyección de tinta, que no se encuentran con sustratos comunes de inyección de tinta (por ejemplo, papel o papel recubierto). Por ejemplo, las fibras textiles pueden variar ampliamente en composición, presentado cada composición un conjunto único de condiciones para una impresión aceptable del sustrato. Por ejemplo, los sustratos de algodón pueden ser muy absorbentes, como en el caso de tintas a base de agua. Cuando la tinta es expulsada del canal de tinta de un dispositivo de impresión de inyección de tinta, ésta se absorbe rápidamente en las fibras del sustrato de algodón. Puesto que estas fibras son mucho más grandes que las fibras típicamente encontradas en sustratos de papel, la densidad del color o apariencia o brillantez del color se disminuye significativamente debido a la falta de retención del colorante en la superficie de las fibras. Adicionalmente, flujo capilar, moteado del patrón de impresión y pérdida de nitidez de la imagen o claridad pueden resultar con frecuencia de la impresión sobre la tela textil misma.

Inversamente, fibras sintéticas como poliéster pueden humedecerse insuficientemente por las tintas acuosas y dichas tintas pueden retenerse solamente en los espacios intersticiales entre las fibras. Esta limitada retención de tinta ocasiona también problemas relacionados con la calidad de impresión esbozados arriba.

Aún más, la permanencia de la imagen impresa sobre telas textiles se logra a menudo comercialmente mediante cierto proceso de curado después de la impresión como calentamiento, vaporeo o fijación química. Estos procesos tienden a ser ineficientes, requiriendo pasos adicionales de lavado y secado para remover de la tela el colorante no fijado. En consecuencia, es deseable mejorar la permanencia de la imagen impresa sobre sustratos impresos de inyección de tinta, en presencia o en ausencia de un paso de curado después de la impresión.

En el comercio se emplean típicamente materiales poliméricos para modificar las propiedades de fibras textiles, naturales y sintéticas, y sustratos. Estos tratamientos poliméricos pueden alterar la apariencia textil o mano, reducir el encogimiento, reducir la flamabilidad, o alterar otras propiedades de la fibra o sustrato. Incluso pueden emplearse tratamientos para aumentar la facilidad de impresión y/o rendimiento de la impresión cuando se emplean procesos de impresión comercial, tales como impresión de pantalla rotativa. Por ejemplo, se ha usado óxido de polietileno para pretratar un material inicial de tela con el fin de crear un sustrato textil adecuado para impresión de inyección de tinta. Como se revela en la Patente US No. 5,781,216 a Haruta y otros, el uso de sustratos textiles tratados con óxido de polietileno se describe com altamente capaz de proporcionar imágenes de gran profundidad de color con suficiente brillantez y nitidez, pero libres de un flujo capilar objetable del color. Aunque Haruta revela dicho pretratamiento con óxido de polietileno con un agente cationizante para aumentar así la capacidad de coloración de las imágenes, Haruta exige que dicho tratamiento se cure posteriormente mediante pasos adicionales de calentamiento, lavado y secado.

El empleo de polímeros catiónicos como parte de un saturante de látex en una estructura fibrosa hidroenredada se revela en PCT US 98 12712 a Harris y otros, la cual se publicó como WO99/00541. Como se describe en WO99/00541, la saturación de látex requiere típicamente un paso posterior de secado u otras ayudas de curado.

También se conoce el uso de soluciones de embebido con bicarbonato de sodio, carbonato de sodio y urea. Dichas soluciones de embebido se utilizan típicamente por fábricas textiles en pastas de tinta junto con otros aditivos tales como espesantes y no en conjunción con tratamientos de recubrimiento sobre los sustratos textiles mismos antes de imprimirse. Las pastas de tinta se imprimen entonces con pantalla rotativa sobre los sustratos de tela. Sin embargo, un sistema dispensador de pasta de inyección de tinta no puede usarse para impresión de inyección de tinta debido a las limitaciones físicas de la tecnología de impresora de inyección de tinta. Las sales en las pastas corroerán las cabezas de la impresora de inyección de tinta. Por lo tanto, el uso de pasta de tinta es un proceso antieconómico. Más aún, incluso con el empleo de dichas pastas en un proceso convencional de impresión de pantalla, el proceso experimenta una gran cantidad de desteñido del tinte después de la impresión.

Por consiguiente, en el arte subsiste todavía una necesidad de recubrimientos de sustrato imprimible con inyección de tinta y métodos de tratamiento que proporcionen alta densidad óptica con una cantidad

mínima de flujo capilar sobre el sustrato durante y después de la creación de imágenes de impresoras de inyección de tinta. Subsiste también en el arte una de métodos de tratamiento de un sustrato imprimible con inyección de tinta, los cuales puedan aplicarse a sustratos de tela textil. En este aspecto, existe aún en el arte una necesidad de métodos para tratar telas para recibir formulaciones de tinta con inyección de tinta, métodos que permiten una mejor resistencia del color e intensidad del color en una amplia variedad de sustratos textiles. Por último, existe aún en el arte una necesidad de sustratos que no dependan de un paso de curado de la tinta para su fabricación.

Resumen de la Invención

De acuerdo con la presente invención, se ha descubierto que la densidad y calidad del color de la imagen impresa y las propiedades de adhesión y/o resistencia del color de formulaciones de tinta de inyección de tinta a base de tinte ácido y reactivo, cuando se aplican a una variedad de sustratos imprimibles con inyección de tinta, pueden mejorarse tratando los sustratos con formulaciones de recubrimiento usadas en conjunción con soluciones de embebido. En particular, una amplia gama de sustratos de tela textil puede tratarse para mejorar la resistencia del color y la resistencia al lavado de las formulaciones de tinta de inyección de tinta. Las formulaciones de tratamiento incluyen una formulación de recubrimiento acuoso que contiene sólidos y que comprende un polímero catiónico o copolímero, un suavizante textil, urea y bicarbonato de sodio, carbonato de sodio, o una combinación de los mismos, para tintas a base de tinte reactivo, o como alternativa, los mismos polímeros catiónicos y suavizantes de tela, pero adicionalmente urea y sulfato de amonio para tintas a base de tinte ácido. En particular, las formulaciones de tratamiento incluyen alrededor de 5 a 95% de polímeros catiónicos o copolímeros, y alrededor de 5 a 20% de suavizantes de tela. Alternativamente, las formulaciones pueden contener también alrededor de 0–80% de un aglutinante de látex polimérico con el fin de incrementar la resistencia al lavado. Estos porcentajes se basan en sólidos. El contenido total de sólidos para las formulaciones varían típicamente desde alrededor de 10 a 50%. En una modalidad alternativa, puede hacerse uso de recubrimientos de polímeros catiónicos en conjunción con una solución separada de embebido de bicarbonato de sodio o carbonato de sodio y urea para clases de tinte reactivo. En una modalidad alternativa, pueden utilizarse formulaciones de recubrimiento de polímero catiónico en conjunción con una solución separada de embebido de sulfato de amonio y urea para clases de tinte ácido. Los presentes métodos proveen vías para la fijación de tintes, sin importar la clase química o el sustrato de tela textil, y lo hacen así sin necesidad de ningún proceso adicional de curado de la tinta más allá del secado baj

condiciones ambiente. Adicionalmente, la eficacia de los procesos después de la impresión, como vaporeo o curado, puede mejorarse por medio de dichas formulaciones, reduciendo el desperdicio de tinte e intensificando además el vigor del color. Del mismo modo, mediante estas formulaciones puede mejorarse la fijación del pigmento o colorante.

Éstas y otras características y ventajas de la presente invención se harán evidentes luego de una revisión de la siguiente descripción detallada de las modalidades reveladas y las reivindicaciones anexas.

Breve Descripción de los Dibujos

Las Figuras 1A a 1C ilustran polímeros catiónicos ejemplares para uso en formulaciones de tratamiento para sustratos de acuerdo con los presentes métodos inventivos.

La Figura 2 ilustra una vista esquemática de un proceso de inmersión y exprimido para tratar sustratos imprimibles con inyección de tinta.

Descripción Detallada de la Invención

De acuerdo con la presente invención, se proporcionan recubrimientos acuosos y métodos para mejorar las propiedades de adhesión y/o resistencia del color/densidad del color y resistencia al lavado de sustratos imprimibles con inyección de tinta en la ausencia de un paso de calentamiento o curado de tratamiento posterior, incluyendo dichos métodos tratar un sustrato textil con una formulación de recubrimiento acuoso que comprende polímeros catiónicos o copolímeros y suavizantes de tela. En un método deseable, el método comprende tratar un sustrato textil con una formulación de recubrimiento acuoso que incluye 5–95% de polímeros catiónicos o copolímeros, y alrededor de 5–20% de suavizantes de tela. Tal como se expuso anteriormente, estos porcentajes son por ciento de sólidos totales, a menos que se indique lo contrario. Para los propósitos de esta solicitud, el porcentaje de los sólidos totales se calcula dividiendo el valor de las partes secas para un componente particular por las partes secas totales de todos los componentes de la formulación. La presente invención se dirige además a un sustrato tratado imprimible con inyección de tinta donde el tratamiento comprende una formulación de recubrimiento acuoso de polímeros catiónicos o copolímeros y suavizantes de tela. Una modalidad deseable de la presente invención es un sustrato tratado imprimible con inyección de tinta donde el tratamiento de recubrimiento acuoso comprende alrededor de 5 a 95% de polímeros catiónicos o copolímeros, y alrededor de 5 a 20% de suavizantes de tela.

Los copolímeros catiónicos funcionan en la formulación para atraer y fijar moléculas de tinte aniónico de carga opuesta a los sustratos y, en particular, sustratos de tela textil. Los polímeros o copolímeros pueden contener residuos reactivos o grupos capaces de enlazarse cruzadamente a las fibras textiles, con ellos mismos, o con otros componentes presentes en la formulación. Dichas resinas catiónicas pueden incorporar grupos de carga en las cadenas principales de polímero o estructuras de polímero, o como grupos laterales en las cadenas de polímero. Un listado ejemplar de las fórmulas estructurales de dichos polímeros catiónicos se ilustra en las Figuras 1A a 1C. Los polímeros catiónicos para uso en los recubrimientos pueden incluir, pero no se limitan a, polímeros y copolímeros de monómeros de dialildialquil amonio como monómeros de cloruro de dialildimetilamonio, acrilato catiónico y acrilamida como cloruro de acriloxietildimetilamonio o cloruro de acrilaminoetildimetilamonio, vinilpiridina cuaternizada como cloruro de vinilpiridina, y polímeros de polialquilamina y copolímeros. Co-monómeros en dichos sistemas pueden estar conformados por aquellos que modifican la flexibilidad, hidrofobicidad, o propiedades mecánicas de la molécula de polímero. Adicionalmente, pueden incluirse monómeros reactivos y/o auto-condensantes para aumentar la adhesión a la fibra textil u otros componentes en la formulación. Otros ejemplos de polímeros catiónicos con grupos cargados en la cadena principal incluyen polímeros de epihalohidrin-amina como los polímeros Reten™ 204 LS y Kymene™ 557 LX de Hercules Incorporated, de Wilmington, Delaware. Un ejemplo específico de una resina de polímero catiónico preferido es CP 7091 RV disponible de ECC International de Roswell, Georgia, siendo CP 7091 RV un cloruro de poli(dialildimetilamonio-co-diacetona acrilamida).

Suavizantes de tela apropiados que pueden usarse de acuerdo con los presentes recubrimientos/métodos inventivos incluyen, pero no se limitan a, Varisoft 222 de la Witco Corporation de Greenwich, Connecticut, Adogen 432 también de la Witco Corporation, Accosoft 550-75 de la Stepan Company de Northfield, Illinois, Alubrasoft Super 100 y Alubrasoft 116 de la BASF Corporation, Specialty Chemicals Division de Mt. Olive, New Jersey, y Ahcovel Base N-62 de ICI Surfactants o Hodgson Textiles Chemical de Mt. Holly, Carolina del Norte. Suavizantes de tela apropiados incluyen aquellos que son catiónicos o no iónicos y proporcionan los atributos de calidad de impresión y brillantez de imagen al sustrato textil impreso. El suavizante de tela más adecuado para un sustrato de tela textil particular varía según el sustrato de tela. Por ejemplo, se ha descubierto que el suavizante de tela Varisoft 222 se comporta mejor con muestras de tela/pendón de algodón mientras que el Adogen 432 se comporta mejor con muestra de nylon/lycra.

En otra modalidad de la presente invención, los tratamientos de recubrimiento previamente descritos o formulaciones para sustratos imprimibles con inyección de tinta incluyen también un aglutinante de látex con el fin de incrementar aún más la adhesión y/o resistencia al lavado de colorantes sobre los sustratos de tela textil. Se ha encontrado que los sustratos recubiertos receptivos de inyección de tinta que incluyen un aglutinante de tinta proporcionan una mejor densidad y saturación del color, superior calidad de impresión, reducción del empabilamiento o flujo capilar y absorción mejorada de la tinta. Más aún, las formulaciones de recubrimiento o tratamiento proporcionan una imagen impresa resistente al agua cuando se imprime por medio de un proceso de impresión de inyección de tinta, sin la necesidad de pasos de curado después de la impresión como calentamiento, vaporeo, fijación química, o radiación. De igual modo, la presente invención se dirige también a un sustrato tratado imprimible con inyección de tinta donde el tratamiento comprende una formulación de recubrimiento acuoso de polímeros catiónicos o copolímeros, suavizantes de tela y un aglutinante de látex. Una modalidad deseable de la presente invención es un sustrato tratado imprimible con inyección de tinta donde la formulación de recubrimiento acuoso comprende alrededor de 5 a 95% de polímeros catiónicos o copolímeros, alrededor de 5 a 20% de suavizantes de tela y alrededor de 0 a 80% de un aglutinante de látex.

Las formulaciones de tratamiento o recubrimiento en esta modalidad alternativa está conformado principalmente por polímeros catiónicos y copolímeros, suavizantes de tela y un polímero insoluble en agua en la forma de una dispersión de látex o emulsión. En particular, la formulación de tratamiento puede incluir alrededor de 0–80% de un aglutinante de látex polimérico dependiendo del sustrato de tela textil. Los polímeros reforzadores de látex pueden ser no iónicos o catiónicos. A modo de ejemplo únicamente, los materiales de látex pueden incluir vinilacetato, etilen-vinilacetato, acrilato, estireno y resinas de estireno-acrilato y otros látexes catiónicos o no iónicos. Estas resinas pueden incluir grupos reactivos o de auto-enlazamiento cruzado, además de funcionalidad catiónica inherente.

Las formulaciones de recubrimiento acuoso pueden incluir también otros aditivos que afecten la apariencia o propiedades táctiles del sustrato terminado, como brillantez óptica. Debe reconocerse que todos los porcentajes expuestos se basan en sólidos, a menos que se anote lo contrario. El contenido de sólidos totales para las formulaciones varía típicamente desde alrededor de 5 a 50%, pero deseablemente varía desde alrededor de 5 a 32%. Más deseablemente, el contenido de sólidos totales para las formulaciones varía desde alrededor de 25 a 28%.

Las formulaciones de tratamiento (composiciones) para los sustratos textiles se elaboran agregando los componentes ya mencionados de soluciones patrón o dispersiones, o como sólidos, donde se estime apropiado, y mezclando hasta obtener homogeneidad. La aplicación de la formulación de tratamiento a los sustratos textiles puede llevarse a cabo por cualquiera de los medios conocidos por aquellas personas que tienen una habilidad ordinaria en el arte. Por ejemplo, los sustratos de tela pueden tratarse con un método estándar de engomado (inmersión y exprimido) y secarse en un horno de aire forzado, aunque puede emplearse cualquier método adecuado de secado de textiles conocido por aquellas personas con habilidades en el arte. Como puede apreciarse en FIG. 2, que muestra una vista esquemática de un proceso de inmersión y exprimido 10 para tratar sustratos imprimibles con inyección de tinta, un sustrato textil 20 se desenrolla del rollo entrante 30 y se sumerge luego en un tanque/baño saturador 40 durante un tiempo suficiente para que se sature con la formulación de tratamiento. El sustrato textil se corre entonces a través de un juego de rodillos presurizados con línea de contacto 44 y 48. La presión sobre los rodillos debe estar en el rango de alrededor de 10-120 psig, pero deseablemente en el rango de alrededor de 10-65 psig, dependiendo del tipo de sustrato de tela textil utilizado y el contenido de sólidos totales de las formulaciones de tratamiento empleadas. Los rodillos presurizados con línea de contacto exprimen el recubrimiento uniformemente sobre el sustrato de manera que penetre la superficie del sustrato. Los rodillos pueden ser de caucho o acero, sin embargo es deseable un juego de rodillos en el cual por lo menos un rodillo sea de caucho. A continuación del paso por los rodillos de presión con línea de contacto, el sustrato textil se dirige a través de un medio de secado 50. El medio de secado puede incluir un marco tensor para sostener el sustrato textil, y él mismo puede incluir múltiples medios consecutivos de secado dependiendo de la naturaleza del sustrato a secar. La temperatura de secado está preferiblemente en el rango de desde alrededor de 200°F a 325°F, deseablemente ente alrededor de 220 a 250°F. El tiempo típico de secado se encuentra entre alrededor de 30 segundos y 3 minutos. A continuación del secado, el sustrato textil tratado y terminado se toma en un rodillo de enrollamiento 52. El sustrato textil puede enrollarse para almacenamiento o llevarse a un segundo proceso de laminación en preparación para la impresión con inyección de tinta. El sustrato textil puede laminarse en un respaldo de soporte para facilidad de impresión.

Empleando este método de aplicación, los índices de levantamiento del sustrato textil pueden variar desde alrededor de 0.5% a alrededor de 50%. Deseablemente, los índices de levantamiento seco pueden variar desde alrededor de 3 a alrededor de 20%. Más deseablemente, los índices de levantamiento seco pueden variar desde

alrededor del 6 a alrededor de 15%. Los índices de levantamiento húmedo para los sustratos textiles se encuentran típicamente entre alrededor de 30-150%. Deseablemente dichos índices de levantamiento húmedo están entre alrededor de 80-120%. Deseablemente para pendones de dacrón, los índices de levantamiento húmedo se sitúan entre alrededor de 40-120%. Estos términos se definen por las ecuaciones que siguen.

Los sustratos que pueden tratarse de acuerdo con los presentes métodos inventivos son variados e incluyen papel, tela, películas y similares, aunque se prefieren sustratos de tela textil. Dichos sustratos pueden incluir algodón, seda, lana, poliéster, rayón, nylon y sus mezclas. Más aún, los sustratos revelados de inyección de tinta pueden proporcionar las ventajas reveladas aquí con o sin pasos adicionales de curado después de la impresión que incluyan el uso de calor, radiación o presión. Idealmente dichos sustratos tratados proporcionan adhesión y/ resistencia del color del colorante con tan sólo un curado a temperatura ambiente o temperatura del recinto y secado de la imagen impresa. Debe notarse sin embargo que, aunque no siendo necesario para el proceso, un paso de curado después de la impresión puede mejorar aún más la resistencia del color y la resistencia al lavado de la imagen impresa sobre el sustrato. El peso base de las diferentes telas que pueden tratarse por estas formulaciones puede variar desde alrededor de 2 onzas por yarda cuadrada (osy) a alrededor de 9 osy.

Clases de tintes que pueden emplearse en impresoras de inyección de tinta a imprimirse sobre dichos sustratos incluyen tintes ácidos, tintes reactivos, tintes directos, tintes azoicos, tintes de azufre, tintes modificados, tintes poliméricos, tintes copolimerizados u otras clases de colorantes conocidos por aquellas personas con habilidades en el arte. Más aún, pueden emplearse colorantes de pigmento en las impresoras de inyección de tinta a imprimirse en dichos sustratos. Adicionalmente, se ha encontrado que cuando dicho sustrato se imprime con tintas de inyección de tinta que contienen aditivos, tales como los descritos en la Solicitud Número de Serie 09/109,681, presentada el 2 de julio de 1998 y la Patente US No. 5,897,694 incorporadas aquí por referencia en su totalidad, dichos tratamientos del sustrato pueden intensificarse con el fin de mejorar la resistencia del color y la resistencia al lavado.

En una modalidad más de la presente invención, dichas formulaciones de tratamiento previamente descritas pueden emplearse en un método para tratar sustratos de tela textil de pendón. Dichos materiales de sustrato incluyen 100% algodón, 100% poliéster, 100% seda, nylon, rayón y materiales mezclados, como mezclas de algodón y poliéster, al igual que materiales no tejidos. Por ejemplo, se ha

descubierto que el tratamiento previo de sustrato de tela textil de pendón con una formulación de recubrimiento acuoso que incluya polímeros catiónicos, suavizantes de tela y aglutinantes de polímero de látex de acuerdo con los métodos previamente descritos habilitan a los sustratos de pendón para que sean imprimibles con inyección de tinta, con una resistencia mejorada al cambio del color/densidad del color y resistencia al lavado, y con flujo capilar reducido del color. Igualmente, la presente invención se dirige también a un sustrato de pendón imprimible con inyección de tinta donde el tratamiento comprende una formulación de polímeros catiónicos o copolímeros, suavizantes de tela y un aglutinante opcional de látex. Una modalidad deseable de la presente invención es un sustrato de pendón imprimible con inyección de tinta donde la formulación de tratamiento acuoso incluye entre alrededor de 5-95% de polímeros catiónicos o copolímeros, entre alrededor de 5-20% de suavizantes de tela y entre alrededor de 0-80% de aglutinante de látex.

De acuerdo con aún una modalidad más de la presente invención, se proporcionan artículos producidos por los métodos ya descritos, empleando sustratos de textil tratados como se describe aquí. Dichos artículos pueden incluir por ejemplo pendones, papel de colgadura y otros productos de amoblado del hogar. Así, de acuerdo con la presente invención, imágenes impresas con inyección de tinta aplicadas a un sustrato tratado como se describe aquí, resisten la remoción de dicha imagen de dicho sustrato, incluso en contacto repetido con agua del sustrato impreso. Dicho contacto repetido puede ser el resultado del manejo normal de un artículo, exposición accidental a líquido y lavado de rutina del artículo. Cuando los artículos de acuerdo con la presente invención comprenden un sustrato que incluye una imagen con inyección de tinta impresa sobre ellos, la imagen resultante se adhiere suficientemente a dicho sustrato para resistir la remoción de allí al lavar dicho artículo. La presente invención, incluyendo cada una de las diferentes modalidades, se describe con más detalle con los ejemplos que siguen. No obstante, dichos ejemplos no tienen que interpretarse como limitantes en ningún modo el espíritu ni la órbita de la presente invención.

Ejemplos Preliminares

Muestras de sustrato textil se imprimieron primero con un patrón de ensayo utilizando una impresora comercial de inyección de tinta que empleaba tintas de inyección de tinta que contenía tintes ácidos, reactivos y/o directos. Se evaluaron la densidad del color, el flujo capilar del color y la calidad de impresión en las muestras una vez impresas. Estos textiles incluían sustratos textiles de popelina de algodón. Duplicados de ambos juegos de muestras se lavaron usando un método de lavado como el que

se describe. Se evaluaron la densidad del color, flujo capilar del color, calidad de impresión o apariencia y permanencia del color utilizando las muestras lavadas. Los datos de los ejemplos preliminares se expresan en la siguiente Tabla 1.

TABLA 1

TINTA	ADITIVO DE TINTA	TRATAMIENTO DE LA TELA	TRATAMIENTO CON CALOR	RESISTENCIA DEL COLOR EVALUACIÓN CON AGUA DELTA E	DETERGENTE DELTA E
Encad GA	Ninguno	Ninguno	Ninguno	< 56	<82
Encad GA	Ninguno	0.5% CP 7091 RV	Ninguno	< 29	<66
Encad GA	Ninguno	1.0% CP 7091 RV	Ninguno	< 28	<50
Encad GA	Ninguno	2.0% CP 7091 RV	Ninguno	< 27	<32

CP 7091 RV es un copolímero de cloruro de dialildimetil amonio/acilamida de diacetona, ECC International. Tintas Encad GA emplean tintes monoméricos estándar. Las muestras se lavaron manualmente. El muestreo analizó tintas magenta. Delta E se calculó en las muestras empleando el espectrodensitómetro y la ecuación descritos más adelante. El muestreo se realizó utilizando un método de inmersión y exprimido, como se describió anteriormente. Como puede verse, el recubrimiento en los Ejemplos Preliminares sólo incluía polímero catiónico en la formulación acuosa. El porcentaje representa solución porcentual.

Un segundo juego de ensayos más rigurosos se llevó a cabo en una variedad de sustratos de tela. Estos sustratos de tela textil incluyen los materiales enumerados en la Tabla 2.

TABLA 2

TELA	ESTILO	Construcción	FUENTE	PESO BASE (OZ/YD^2)	PESO BASE UNIDADES SI (G/M^2)
Popelina de Poliéster	RP 6248	Tejido Plano	Fisher Textiles	3.8	128.8
Satín de Poliéster	PS 241	Satín	"	4.1	139.0
Dacrón Poliéster 250 Denier	Dacrón 250	Tejido Plano	"	3.2	108.5

Popelina de Algodón	9680	"	Lorber Industries	6.5	220.39
Jersey de Algodón	5118	Tejido de Punto	"	8.2	277.9
Sábana de Algodón		Tejido Plano	Cranston Mills	7.0	237.2
Charmeuse de Seda .16 mm	12104	Satín	U.S. Silk, Inc.	2.0	67.8
Crepe de Chine de Seda .18 mm	14654	Crepé	"	2.3	78.0
Georgette de Poliéster	NOFU7-6058[a]	Georgette Crepé	Scher Fabrics, Inc.	3.8	128.8
Crepé Estirado de Poliéster		Tejido de Punto	"	3.2	108.5
Mezcla Poliéster/ Lycra	55153	Tejido de Punto	Guilford Mills	5.5	186.4
Mezcla Nylon/Lycra	56062	Tejido de Punto	"	4.0	135.6
Rayón	YWSR 1352	Crepé	U.S. Silk, Inc.	3.5	118.6

U.S. Silk, Inc. se encuentra ubicada en Nueva York, NY. Guilford Mills se encuentra localizada en Nueva York, NY. Scher Fabrics tiene su sede en Nueva York, NY. Cranston Mills se halla en Cranston, RI. Lorber Industries se localiza en Gardena, CA. Fisher Textiles se ubica en Indian Trail, NC.

Condiciones para el Segundo Grupo de Ejemplos
Pasos de Impresión

En cada uno de los siguientes ejemplos las muestras textiles tratadas se imprimieron utilizando una impresora de inyección de tinta Encad Pro E (@ 300 dpi) de Encad Inc. de San Diego, California. Se emplearon tintas Encad GA, GS, o GO utilizando Modo de Impresión Mejorado de 4 Pasadas, es decir con la impresora pasando sobre el sustrato textil cuatro veces. En algunos casos, como se anota com doble

impacto en las tablas de datos, la cabeza de impresión se precalentó y se escogió la opción identificada como número "7" en la impresora. Esta opción permitió que se expulsara más tinta de la impresora sobre los sustratos. Los tintes en las tintas estaban conformados por tintes reactivos, ácidos y/o directos y se describen en la Tabla 3.

TABLA 3
Tintas Usadas

Tinta GS		
Color	Orden#	Tintes
Cian	209489	Directo
Magenta	208163-2	Ácido/Reactivo
Amarillo	208163-3	Ácido
Negro	208163-4	Directo
Tinta GS		
Color	Orden#	
Cian	208165-1	Pigmento
Magenta	208165-2	Pigmento
Amarillo	208165-3	Pigmento
Negro	208165-4	Pigmento
Tinta GS		
Color	Orden#	Tintes
Cian	209491	Directo
Magenta	209490	Ácido
Amarillo	208164-3	Ácido
Negro	208164-4	Directo

Los tamaños de las muestras fueron típicamente 11 por 15 pulgadas. Adicionalmente, se empleó una impresión floral de tres colores, que utilizaba lavanda, verde y magenta para hacer pruebas, de alrededor de 14 por 25 pulgadas de tamaño. Donde fue difícil distinguir entre tonalidades de verde, se evaluó también una porción neutral (es decir libre de tinta) de la muestra.

Mediciones del Color

Las mediciones de los valores de color L* a* b* (CIE 1976 Commission Internationale de l'Eclairage) y densidad óptica se realizaron en los sustratos textiles impresos empleando un Espectrodensitómetro X-Rite 938 (D65/10°) que usaba filtros CMY, de acuerdo con el manual del operador. El espectrodensitómetro X-Rite se obtuvo de la X-Rite Corporation de Grandville, Michigan. Se tomaron densidades ópticas

promedio como la sumatoria del promedio de tres mediciones empleando cada filtro. Delta E se calculó de acuerdo con la siguiente ecuación:

$$\Delta E = SQRT\ [L^*patrón - L^*muestra)^2 + (a^*patrón - a^*muestra)^2 + (b^*patrón - b^*muestra)^2]$$

A mayor Delta E, mayor es el cambio en la densidad del color. A menos que la intensidad del color se aumente mediante un paso de curado, un gran aumento en Delta E sería típicamente indicativo de desvanecimiento. Las pruebas se realizaron de acuerdo con ASTM DM 224-93 y ASTM E308-90. Donde los valores para Delta E son menores que 3.0, se acepta generalmente que dicho cambio de color no puede observarse con el ojo humano. Una descripción detallada de las pruebas con espectrodensitómetro se obtiene en Color Technology in the Textile Industry, segunda Edición, Publicada en 1997 por AATCC (American Association of Textile Chemists & Colorists).

Método de Lavado para Muestras Textiles

Cuando era indicado, las muestras textiles se lavaron empleando el siguiente método. Las muestras se depositaron en un vaso de pico de tamaño apropiado o recipiente como un vaso de pico de litro. Las muestras se pusieron luego bajo agua fría corriente (entre alrededor de 10-20°C) durante cerca de dos minutos. A continuación se extrajo el agua fría de las muestras textiles. Los vasos de pico se llenaron entonces con agua caliente (entre alrededor de 40-50°C) y se agregó una onza de detergente (Synthrapol ®) por galón de agua a los vasos de pico.

Las muestras textiles se lavaron entonces durante alrededor de cinco minutos y luego se enjuagaron y se les extrajo el agua restante. Finalmente. Las muestras textiles se enjuagaron con agua tibia (de entre alrededor de 25-30°C) durante dos minutos seguida por un enjuague con agua fría (de entre alrededor de 10-20°C) durante alrededor de un minuto más.

Típicamente, aunque no requerido necesariamente para curado, un segundo juego de muestras se imprimieron y, posteriormente, se vaporizaron empleando un evaporador de laboratorio para comparación. Para los fines de los ejemplos, si un nivel de resistencia del color se caracterizaba como deficiente, había ocurrido empabilamiento o fluj capilar. Si un nivel de resistencia del color se caracterizaba como deficiente, la imagen se destefiía. Si un nivel de resistencia de cambio del color y resistencia al lavado se había caracterizado como bueno, el vigor del color y la retención de imagen eran notoriamente mejores que el nivel deficiente. Si los niveles de resistencia del color y la resistencia al lavado se caracterizan como excelentes, las propiedades del color y vigor eran los niveles más altos con la densidad del color más alta.

Ejemplos

Debe anotarse que para cada uno de los siguientes ejemplos, el sustrato textil se había laminado en un respaldo de papel recubierto adhesivo que se había obtenido de American Builtrite Inc. bajo la designación ProtecRite ® 6798 antes de la impresión para habilitar al sustrato para que se pase fácilmente a través de la impresora. Los sustratos se retiraron luego del respaldo antes del lavado. Papeles de respaldo recubiertos adhesivos identificados por la designación 6798 incluyen un papel que tiene un espesor nominal de 5.4 ml, un valor inicial de adhesión de 27 oz/in, una resistencia a la tensión de 16 lbs/in y una capacidad de alargamiento del 10%. Las formulaciones de lote utilizadas se describen en los siguientes sumarios de ejemplos.

Ejemplo 1. Copolímero catiónico CP 7091 RV (ECC International), cloruro de poli(dialildimetilamonio-co-diacetona acrilamida), se obtuvo en una solución patrón de 49.3% en agua. 20.3 partes húmedas de esta solución (10 partes secas, o alrededor de 90-91% de las partes secas totales) se adicionaron a 70.3 partes de agua mezclando al mismo tiempo. Se agregaron 1.1 partes húmedas (1 parte seca, o alrededor de 9% de las partes secas totales) de suavizante de tela Varisoft ® 222 (90% en agua) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar popelina de algodón 100% vía la aplicación de un engomado y se secó como se describió previamente. Una porción de esta muestra se laminó en un soporte [base] de papel adhesivo, impreso con una impresora de inyección de tinta y se secó bajo condiciones ambiente. Las propiedades de la muestra se evaluaron en cuanto calidad de la imagen impresa, retención de la tinta y densidad del color o saturación bajo las siguientes condiciones: 1) inmediatamente después de la impresión, 2) después de la impresión y lavado, 3) después de la impresión y vaporeo, 4) después de la impresión, vaporeo y lavado. Las muestras impresas exhibieron calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron presentaron una intensificación excelente del color y apariencia. La resistencia al lavado de las muestras vaporeadas y de las muestra sin tratamiento posterior con vapor exhibieron retención moderada del color cuando se lavaron. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 2. La formulación empleada en Ejemplo 1 se utilizó para tratar tela georgette de poliéster 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 1. Este ejemplo empleó componente de tinta GS y componente de tinta GO.

Ejemplo 3. 20.3 partes húmedas (copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (10 partes secas o alrededor de 90-91% de las partes secas totales) se agregaron a 48.9 partes de agua mezclando al mismo tiempo. Se añadieron 22.5 partes húmedas de suavizante de tela Adogen® 432 (4.4% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerla homogénea. La formulación se utilizó para tratar popelina de algodón 100% por medio de la aplicación de un engomado convencional y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron presentaron intensificación excelente de color y apariencia. La resistencia al lavado de las muestras vaporeadas y las muestras sin tratamiento posterior con vapor exhibieron retención moderada del color cuando se lavaron. Este ejemplo utilizó componente de tinta GS.

Ejemplo 4. La formulación empleada en Ejemplo 3 se usó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 3. Este Ejemplo empleó componente de tinta GS.

Ejemplo 5. La formulación empleada en Ejemplo 3 se usó para tratar tela crepe de chine de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 3. Este Ejemplo empleó componente de tinta GS.

Ejemplo 6. 20.3 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) se agregaron a 48.9 partes de agua mezclando al mismo tiempo. Se agregaron 11.3 partes húmedas de suavizante de tela Adogen® 222 (4.4% en agua) y 11.3 partes húmedas de Varisoft® 222 (4.7% en agua) y toda la solución se mezcló hasta hacerla homogénea. Esta formulación se empleó para tratar popelina de algodón 100% por medio de una aplicación de engomado convencional y se secó. La muestra se imprimió y evaluó utilizando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron exhibieron excelente intensificación de color y apariencia. La resistencia al lavado de las muestras vaporeadas y las muestras sin tratamiento posterior con vapor presentaron retención moderada del color al lavarlas. Este Ejempl utilizó componente de tinta GS.

Ejemplo 7. Una composición de tratamiento se formuló como en el Ejempl 6, sustituyendo 23.1 partes húmedas de suavizante de tela

Accosoft® 550 (4.3% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) por partes de suavizante de tela Adogen® 432. El polímero catiónico constituía 10 partes secas o alrededor de 90-91% de las partes secas totales. Las partes húmedas de agua constituían alrededor de 48.2 partes. Esta formulación se empleó para tratar popelina de algodón 100% por medio de aplicación de engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron exhibieron excelente intensificación de color y apariencia. La permanencia del color al lavado de las muestras vaporeadas se incrementó dramáticamente comparada con las muestras no tratadas. Se logró cierta mejora de la resistencia del color sin vaporeo. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 8. La formulación empleada en Ejemplo 7 se utilizó para tratar tela mezclada 85/15 nylon/lycra. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 7. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 9. La formulación empleada en Ejemplo 7 se utilizó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 7. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 10. Una composición de tratamiento se formuló como en el Ejemplo 3, sustituyendo 22.7 partes húmedas de suavizante de tela Alubrasoft® Super 100 (4.4% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) por partes de suavizante de tela Adogen® 432. La formulación incluía 20.3 partes húmedas de 7091 RV (10 partes secas, o alrededor de 90-91% de las partes secas totales) y 48.7 partes de agua. Esta formulación se empleó para tratar popelina de algodón por medio de una aplicación de engomado convencional y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron exhibieron excelente intensificación de color y apariencia. La permanencia del color al lavado de las muestras vaporeadas se incrementó dramáticamente comparada con las muestras no tratadas. Se logró cierta intensificación de la resistencia del color sin vaporeo. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 11. La formulación empleada en Ejemplo 10 se utilizó para tratar tela mezclada 85/15 nylon/lycra. Los resultados para esta tela

fueron similares a los obtenidos en Ejemplo 10. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 12. La formulación empleada en Ejemplo 10 se utilizó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 10. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 13. Una composición de tratamiento se formuló como en el Ejemplo 3, sustituyendo 8.8 partes húmedas de suavizante de tela Ahcovel® (11.3% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) por partes de suavizante de tela Adogen® 432. La formulación incluía 20.3 partes húmedas de 7091 RV (10 partes secas, o alrededor de 90-91% de las partes secas totales) y 62.5 partes de agua. Esta formulación se empleó para tratar popelina de algodón 100% por medio de una aplicación de engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún fluj capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron exhibieron excelente intensificación de color y apariencia. La permanencia del color al lavado de las muestras vaporeadas se incrementó dramáticamente comparada con las muestras no tratadas. Se logró buena intensificación de la resistencia del color sin vaporeo. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 14. Copolímero catiónico CP 261 LV (ECC International), poli(dialildimetilamonio), se obtuvo en una solución patrón de 43.0% en agua. Se adicionaron 23.3 partes húmedas de esta solución (10 partes secas, o alrededor de 90-91% de las partes secas totales) a 47.1 partes de agua mezclando al mismo tiempo. Se agregaron 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron retención moderada del color cuando se lavaron. Se logró cierta intensificación de la resistencia del color. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La resistencia al lavado de las muestras vaporeadas y de las muestras sin tratamiento posterior con vapor exhibieron retención moderada del color cuando se lavaron. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 15. 28.8 partes húmedas de una solución que contenía 80% de polietilenimina etoxilada (34.7% en agua) (10 partes secas, o alrededor de 90-91% de las partes secas totales) se combinaron con 41.6 partes de agua mezclando al mismo tiempo. Se agregaron 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron retención moderada del color cuando se lavaron. Se logró cierta intensificación de la resistencia del color. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La resistencia al lavado de las muestras vaporeadas y de las muestras sin tratamiento posterior con vapor exhibieron retención moderada del color cuando se lavaron. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 16. 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 18-19% de las partes secas totales) se adicionaron a 656 partes de agua mezclando al mismo tiempo. Se agregaron 90.6 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etileno-vinilacetato, 55.2% en agua) (50 partes secas, o alrededor de 37% de las partes secas totales) de AirProducts and Chemicals Inc. de Allentown, Pensilvania, 114.9 partes húmedas de emulsión acrílica PrintRite® 595 (BF Goodrich, 43.5% en agua) (50 partes secas, o alrededor de 37% de las partes secas totales) y 212.8 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (10 partes secas, o alrededor de 7% de las partes secas totales) se agregaron y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron retención buena del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 17. La formulación empleada en Ejemplo 16 se utilizó para tratar tela de punto jersey de algodón 100%. Los resultados para esta tela

fueron similares a los obtenidos en Ejemplo 16. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 18. La formulación empleada en Ejemplo 16 se utilizó para tratar tela mezclada 85/15 nylon/lycra. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 16. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 19. La formulación empleada en Ejemplo 16 se utilizó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 16. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 20. La formulación empleada en Ejemplo 16 se usó para tratar tela crepe de chine de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 16. Este Ejemplo empleó componente de tinta GS.

Ejemplo 21. 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 18-19% de las partes secas totales) se adicionaron a 656.0 partes de agua mezclando al mismo tiempo. Se agregaron 90.6 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etileno-vinilacetato, 55.2% en agua) (50 partes secas, o alrededor de 37% de las partes secas totales), 114.9 partes húmedas de emulsión acrílica PrintRite® 591 (BF Goodrich, 43.5% en agua) (50 partes secas, o alrededor de 37% de las partes secas totales) y se agregaron 212.8 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (10 partes secas, o alrededor de 7% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. Esta formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 22. La formulación empleada en Ejemplo 21 se utilizó para tratar tela de punto jersey de algodón 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 21. Este Ejemplo utilizó componente de tinta GS.

Un resultado de la muestra para valores Delta E se refleja en la siguiente Tabla 4. Debe reconocerse que los valores para Delta E pueden variar de 0 a 100 prefiriéndose los valores más bajos para demostrar pérdida mínima de vigor del color/desvanecimiento. Los valores Delta E son una comparación de muestras "tratadas y lavadas" o "tratadas y lavadas en seco" versus muestras "tratadas". En algunos casos, los valores Delta E son una comparación de muestras "tratadas, vaporeadas y lavadas" versus muestras "tratadas". Las telas textiles que fueron capaces de imprimirse sin un recubrimiento experimentaron atributos de impresión deficientes y desteñido total (con un Delta E teóricamente en cerca de 100). Los siguientes datos se aplican a una muestra de Cranston Cotton, la cual se trató con una formulación de recubrimiento como se describe en Ejemplo 21. 00179

Tabla 4

TRATADA	L*	A*	B*	DELTA E
Magenta	58.0	30.8	-17.6	Estándar
Tratada & Lavada				
Magenta	59.0	37.2	-22.9	8.3

Ejemplo 23. La formulación empleada en Ejemplo 21 se utilizó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 21. Este sustrato se limpió utilizando equipos comerciales de limpieza en seco y los resultados de la mezcla se reflejan en la siguiente Tabla 5. Este Ejemplo utilizó componente de tinta GS.

Tabla 5

TRATADA	L*	A*	B*	DELTA E
Magenta	46.9	54.8	-5.2	Estándar
Negro 1	29.5	1.8	0.5	Estándar
Amarillo	83.6	5.0	91.8	Estándar
Cian	61.8	-27.9	-31.2	Estándar
Limpiado en Seco				
Magenta	44.7	54.6	-5.0	2.3
Negro 1	27.7	1.4	-0.3	2.0
Amarillo	82.4	4.7	90.3	1.9
Cian	60.6	-28.5	29.8	1.8

Ejemplo 24. 10.1 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) se adicionaron a 48.8 partes de agua mezclando al mismo tiempo. Se agregaron 11.5 partes húmedas de emulsión acrílica PrintRite® 591 (BF Goodrich, 43.5% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) y 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse hom génea. Esta formulación se usó para tratar

popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La resistencia al lavado de las muestras vaporeadas y de las muestras no tratadas posteriormente con vapor mostraron una retención moderada del color cuando se lavaron. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 25. La formulación empleada en Ejemplo 24 se utilizó para tratar tela mezclada 85/15 nylon/lycra. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 24. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 26. 10.1 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) se adicionaron a 48.8 partes de agua mezclando al mismo tiempo. Se agregaron 11.5 partes húmedas de emulsión acrílica PrintRite® 595 (BF Goodrich, 43.5% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) y se agregaron 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. Esta formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 27. La formulación empleada en Ejemplo 26 se utilizó para tratar tela mezclada 85/15 nylon/lycra. La muestra impresa exhibió calidad de imagen superior con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado no mejoró en estas muestras. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 28. 10.1 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) se adicionaron a 51.2 partes de agua

mezclando al mismo tiempo. Se agregaron 9.1 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etileno-vinilacetato, 55.2% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) y se agregaron 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. Esta formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 29. La formulación empleada en Ejemplo 28 se utilizó para tratar tela mezclada 85/15 nylon/lycra. La muestra impresa exhibió calidad de imagen superior con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado no mejoró en estas muestras. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 30. 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 18-19% de las partes secas totales) se adicionaron a 881.9 partes de agua mezclando al mismo tiempo. Se agregaron 181.3 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etileno-vinilacetato, 55.2% en agua) (100 partes secas, o alrededor de 74% de las partes secas totales) y se añadieron 11.1 partes húmedas de suavizante de tela Varisoft® 222 (90% en agua) (10 partes secas, o alrededor de 7% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar una tela de poliéster/pendón de algodón de 250 denier por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. Las muestras impresas exhibieron calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporización u otros pasos.

Ejemplo 31 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 18-19% de las partes secas totales) se adicionaron a 878.0 partes de agua mezclando al mismo tiempo. Se agregaron 181.3 partes húmedas de

emulsión de látex Airflex® 540 (copolímero de etilen-vinilacetato, 55.2% en agua) (100 partes secas, o alrededor de 74% de las partes secas totales) y 15.0 partes húmedas de suavizante de tela Adogen® 432 (66.7% en agua) (10 partes secas, o alrededor de 7% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar una tela de poliéster/pendón de algodón de 250 denier por medio de la aplicación de un engomado y se secó. La muestra se imprimió como se describe en Ejemplo 1. Las muestras impresas exhibieron calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos.

Las muestras textiles en Ejemplos 30 a 35 se imprimieron con componente de tinta Encad GO obtenido de la Encad Inc.

Ejemplo 32. La formulación empleada en Ejemplo 31 se utilizó para tratar una tela de popelina de poliéster. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos de curado.

Ejemplo 33. La formulación empleada en Ejemplo 31 se utilizó para tratar una tela de satín de poliéster. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos de curado. Adicionalmente, la muestra poseía excelente reflectividad visual al color. Dicha calidad puede observarse visualmente o medirse mediante métodos de reflectancia difusa.

Ejemplo 34. La formulación empleada en Ejemplo 31 se utilizó para tratar una tela de popelina de poliéster. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos.

Ejemplo 35. La formulación empleada en Ejemplo 31 se utilizó para tratar una tela de satín de poliéster. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos. Adicionalmente, la muestra poseía excelente reflectividad al color.

Ejemplo 36. 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 17% de las partes secas totales) se adicionaron a 993.5 partes de agua mezclando al mismo tiempo. Se agregaron 230.9 partes húmedas de emulsión acrílica PrintRite® 591 (BF Goodrich, 43.3% en agua) (100 partes secas, o alrededor de 68-69% de las partes secas totales) y 296.3 partes húmedas de suavizante de tela Varisoft® 475 (6.8% en agua) (20 partes secas, o alrededor de 13-14% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar charmeuse de seda 100% por medio de la aplicación de un engomado y se secó. El levantamiento húmedo fue de 140%. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. El Ejemplo utilizó componente de tinta GS. 00183

Resultados de los Ensayos 30-36

Las imágenes impresas sobre las muestras textiles de los Ejemplos 29-35 fueron resistentes al agua y exhibieron resistencia aceptable a la luz para estabilidad en exteriores de acuerdo con el método de ensayo ASTM G26 cuando se imprimieron con tintas Encad GO. El método de ensayo ASTM G26 incluía los siguientes pasos:

La práctica estándar bajo ASTM G26 para operar a exposición a la luz (tipo arco de xenón) con y sin agua para exposición de materiales no metálicos consta de los siguientes procedimientos. El método de ensayo 1 se empleó para exposición continua a la luz y exposición intermitente a rociado de agua. El tipo de aparato utilizado consistió en un aparato Atlas Ci 5000. El instrumento se programó para luz continua y rociado intermitente de agua de acuerdo con las instrucciones del fabricante. Se empleó el ciclo convencional de 102 minutos de exposición a la luz seguido por un ciclo de 18 minutos de luz y rociado de agua. Dichas mediciones de datos de muestra se reflejan en la siguiente Tabla 6. El método de modo de impresión es doble impacto, con 102 minutos de luz, 18 minutos de rociado luego de 6 horas.

Tabla 6

POPELINA DE POLIÉSTER FR	L*	A*	B*	DELTA E
Negro 1	29.0	1.7	–3.3	1.5
Cian	60.6	–22.1	–38.5	4.2

Amarillo	89.7	-9.0	64.4	14.5
Magenta	52.3	49.1	-10.0	2.6

De los datos experimentales se determinó que los recubrimientos deseables por tipo de tela son los siguientes: popelina de algodón y jersey de punto emplean deseablemente el recubrimiento descrito en Ejemplo 21 con alrededor de 13% de sólidos totales; seda crepe de chine y charmeuse utilizan el recubrimiento descrito en Ejemplo 36 con alrededor de 7% de sólidos totales; georgette de poliéster utiliza el recubrimiento descrito en Ejemplo 30 con alrededor de 32% de sólidos totales; satín de poliester y dacrón de poliéster utilizan el recubrimiento previo (Ejemplo 30) con alrededor de 32% de sólidos totales; y popelina de poliéster utiliza el mismo recubrimiento con entre alrededor de 20-25% de sólidos totales.

Si se desea tratamiento posterior textil (es decir, un paso de calentamiento, como vaporeo, calentamiento en horno, planchado, u otra forma de paso de curado) todavía otra modalidad alternativa de la presente invención se refiere a formulaciones de tratamiento/ recubrimiento y métodos relacionados para tratar sustratos textiles que mejoran el brillo, la adhesión y/o la resistencia al lavado/resistencia a los detergentes de un tinte reactivo para inyección de tinta, tinte ácido y tintas a base de pigmentos sobre sustratos de tela textil, que utiliza una solución de embebido en conjunción con un recubrimiento de sustrato. Para los propósitos de esta solicitud, una solución de embebido significará una solución empleada para saturar una tela de manera que penetre los espacios intersticiales de la tela. La solución de recubrimiento (o tratamiento, como se describió anteriormente) puede incluir ella misma la solución de embebido, o como alternativa, la solución de recubrimiento y la solución de embebido pueden aplicarse en pasos separados de aplicación.

Las formulaciones de tratamiento o recubrimiento en la presente invención constan principalmente de polímeros catiónicos, aglutinantes, suavizantes de tela y otros aditivos similares a los descritos previamente. No obstante, en conjunción con estas formulaciones de recubrimiento, una solución de recubrimiento se emplea para tratar aún más el sustrato de tela. Por ejemplo, en una primera modalidad que utiliza la solución de embebido con componentes de tinta reactiva, una solución de embebido conformada por bicarbonato de sodio o carbonato de sodio y urea (para un brillo adicional de color con tratamiento posterior) se emplea como un tratamiento acuoso de tela recubierta. Deseablemente la solución de embebido se aplica en un nivel de entre alrededor de 5-20% en peso, más deseablemente 5-10% en peso dependiendo del tipo de tela, y usando un método estándar de saturación/engomado. Cuando la solución de embebido se hace parte de la composición de recubrimiento acuoso, el

bicarbonato de sodio, carbonato de sodio, o combinación, se encuentra deseablemente presente en la solución de embebido/recubrimiento en una cantidad entre alrededor de 3 y 10 por ciento de los sólidos totales. Deseablemente, la urea se halla presente en la solución de embebido/recubrimiento combinado en una cantidad entre alrededor de 5 y 12 por ciento de los sólidos totales. Pueden incluirse otros aditivos en la solución de embebido/recubrimiento combinado, tales como agentes humectantes y antiespumantes. Si los aditivos están presentes en la formulación, lo están deseablemente en una cantidad entre alrededor de 0.1 y 1 por ciento de los sólidos totales. Por ejemplo el agente humectante Q2-511 puede incluirse en la solución de embebido/ recubrimiento combinado. Opcionalmente, pueden incluirse también fijadores de tinte en la formulación en menos de alrededor del 5% de los sólidos totales.

Cuando la solución de embebido se aplica como solución separada a continuación de la aplicación de la formulación de recubrimiento, el bicarbonato de sodio/carbonato de sodio se halla también deseablemente presente en una cantidad entre alrededor de 30 y 40 por ciento de los sólidos totales. La urea se encuentra presente en la solución separada de embebido en una cantidad entre alrededor del 50 y 70 por ciento de sólidos. Cuando la solución de embebido se utiliza como una solución separada de la formulación de recubrimiento, puede incluir también un agente humectante en solución así como otros aditivos en las mismas cantidades que la anterior modalidad. Agua está presente en la solución en una cantidad entre alrededor de 10 y 90 por ciento de la solución. Como se expuso, esta modalidad de solución de embebido se usa deseablemente con las clases de colorante reactivo, incluyendo aquellas que pueden aplicarse por medio del proceso de impresión con inyección de tinta tal como las monoclorotriazinas y/o sulfonas de vinilo.

En una segunda modalidad que emplea una solución de embebido, la solución de embebido acuoso incluye sulfato de amonio y urea para un brillo adicional del color con tratamiento posterior. Tal como se ha expuesto para la modalidad anterior, la solución de embebido puede ser una parte del recubrimiento inicial o una solución separada. En esta modalidad, el sulfato de amonio se halla deseablemente presente en una cantidad entre alrededor de 5 y 10 por ciento de los sólidos totales, cuando se usa como parte de la formulación de recubrimiento. La urea se encuentra deseablemente presente en la solución de embebido/ recubrimiento combinado en una en una cantidad entre alrededor de 2 y 5 por ciento de los sólidos totales. Cuando la solución de embebido es una solución separada de la solución de recubrimiento, el sulfato de amonio se encuentra presente en una cantidad entre alrededor de 30 y 40 por ciento de los sólidos totales. La urea se encuentra presente en esta

solución separada de embebido en una cantidad entre alrededor de 50 y 70 por ciento de los sólidos totales. Otros aditivos pueden incluirse en la solución de embebido/recubrimiento combinado tales como agentes humectantes, tensioactivos y antiespumantes. Por ejemplo, el agente humectante Q2-5211 puede incluirse en la solución de embebido/ recubrimiento combinado. Opcionalmente, pueden incluirse también fijadores de tinte en la formulación de recubrimiento en menos de alrededor del 5 por ciento de los sólidos totales. Para reiterarlo, cuando la solución de embebido se emplea como una solución separada de la formulación de recubrimiento, la solución incluye también agua y, opcionalmente, agentes humectantes. La segunda modalidad tiene que usarse con la clase de tinte ácido que incluye aquellos que pueden aplicarse por medio de procesos de impresión de inyección de tinta. La solución de embebido se aplica deseablemente en un nivel de 5-20% en peso, dependiendo del tipo de tela, y usando un método estándar de saturación/engomado. Más deseablemente, la solución de embebido se aplica en un nivel de 10-15% en peso. Debe notarse que cuando la solución de embebido para las modalidades ya descritas tiene que hacerse en forma separada de la formulación de recubrimiento, pueden mezclarse en una relación 50/50 con la formulación de recubrimiento a aplicarse simultáneamente o, como alternativa, la formulación de recubrimiento puede aplicarse primero a la tela, secarse la tela y luego puede aplicarse la solución de embebido a la tela y después secarse.

Sustratos textiles para uso con los métodos de tratamiento pueden incluir algodón, seda, lino, poliéster, rayón, nylon y mezclas de los mismos. Convencionalmente, se emplean tintes reactivos para sustratos de algodón y tintes ácidos para sustratos de seda y nylon. Sin embargo, debido al tratamiento de recubrimiento y al tratamiento de fijación (solución de embebido) asociado con él, la invención permite la fijación de clases de tintes sobre sustratos con los que no están normalmente asociados, o que no se elaborarían comercialmente porque la fijación n es normalmente fácil ni eficiente. Como se demuestra por el conjunto de ejemplos que siguen, los sustratos revelados receptivos de inyección de tinta, que han sido tratados adicionalmente con una solución de embebido, proporcionan una alta densidad y saturación del color, calidad superior de impresión, reducción del empabilamiento o flujo capilar y mejor absorción de la tinta. Más aún, las formulaciones de recubrimiento o tratamiento proporcionan una imagen impresa con mejor resistencia al agua/detergente cuando se imprime con un proceso de impresión de inyección de tinta con pasos de tratamiento después de la impresión, tales como calentamiento, vaporeo, fijación química o curado por radiación. Con un proceso convencional de vaporeo, ocurre un desteñido mínimo del tinte, presentándose así un desperdicio mínimo del tinte.

186
0018

Esta modalidad alternativa de la presente invención se describe con más detalle por el conjunto de ejemplos que siguen. Dichos ejemplos, sin embargo, no pretenden ser interpretados como limitantes en ninguna forma del espíritu o la órbita de la presente invención.

CONDICIONES DE LOS EJEMPLOS:

Se crearon una serie de recubrimientos incluyendo polímeros catiónicos, suavizantes de tela, aglutinantes de látex, otros aditivos y agua. Los recubrimientos se identifican más adelante con los respectivos porcentajes de contenido. Debe notarse que ciertos recubrimientos incluían una solución de embebido en su formulación mientras que otros no y, en consecuencia, se utilizó una solución de embebido en un paso separado de aplicación. Los tamaños de los lotes se expresan en gramos.

Primer recubrimiento (similar al usado en el Ejemplo previo 21), mencionado como Tipos A, B & D en los ejemplos que siguen, para empleo con telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE (GRAMOS)
CP7091RV	49.3	18.50	37.53	18.01
Airflex 540	55.17	37.00	67.07	32.19
PrintRite 591	43.50	37.00	85.06	40.83
Varisoft 475	10.00	7.40	74.00	35.52
Agua			569.69	273.45
	12	100	833.33	400

Solución de Embebido Separada mencionada como Tipo C para empleo con telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑ DEL LOTE
Bicarbonato de Sodio	63.40	3.00	4.73	22.70
Urea	95.00	5.00	5.26	30.81
Q2-5211	100.00	0.20	0.20	1.17
Agua			58.34	341.49
	12	8.2	68.33	Aprox. 400

Las concentraciones Dyeset (poliamidas), designadas como Dyeset Conc. En las Tablas que siguen, se obtuvieron de Sybron Chemicals de Wellford, Carolina del Sur, junto con Dyeset NOZ y Dyeset NFS. Tales materiales son fijadores de tinte para tintes reactivos. El Q2-5211 que es un agente humectante, se obtuvo de Dow Corning. El bicarbonato de sodio puede obtenerse de VWR de Norcross, Georgia y Baker Chemical, y la urea puede obtenerse de Baker Chemical.

187
09/139

El "Combo", que es una combinación de una solución de recubrimiento y embebido, mencionada en los ejemplos que siguen como Tipo F, para empleo con telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	16.50	33.47	16.06
Airflex 540	55.17	35.00	63.44	30.45
PrintRite 591	43.50	35.00	80.46	38.62
Varisoft 475	10.00	5.40	54.00	25.92
Bicarbonato de Sodio	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Agua			591.97	284.15
	12	100	833.33	400

Recubrimiento (similar al del Ejemplo previo 21), mencionado como Tipo F en los siguientes ejemplos, empleado para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	17.50	35.50	17.04
Airflex 540	55.17	36.00	65.25	31.32
PrintRite 591	43.50	36.00	82.76	39.72
Varisoft 475	10.00	7.40	74.00	35.52
Dyeset NOZ	12.20	3.00	24.59	11.80
Q2-5211	100.00	0.20	0.20	0.10
Agua			551.23	264.59
	12	100	833.33	400

Recubrimiento, mencionado como Tipo G en los ejemplos que siguen, empleado para algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	17.50	35.50	17.04
Airflex 540	55.17	36.00	65.25	31.32
PrintRite 591	43.50	36.00	82.76	39.72
Varisoft 475	10.00	7.40	74.00	35.52
Dyeset NFS	36.70	3.00	8.17	3.92
Q2-5211	100.00	0.20	0.20	0.10
Agua			567.65	272.47
	12	100	833.33	400

Recubrimiento, mencionado como Tipo H en los siguientes ejemplos para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	17.50	35.50	17.04
Airflex 540	55.17	36.00	65.25	31.32

PrintRite 591	43.50	36.00	82.76	39.72
Varisoft 475	10.00	7.40	74.00	35.52
Dyeset Conc.	47.60	3.00	6.30	3.03
Q2-5211	100.00	0.20	0.20	0.10
Agua			569.52	273.37
	12	100	833.33	400

Recubrimiento, mencionado como Tipo I en los siguientes ejemplos para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	15.50	31.44	15.09
Airflex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset Conc.	47.60	3.00	6.30	3.03
Bicarbonato de Sodio	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Agua			591.81	284.07
	12	100	833.33	400

Recubrimiento, mencionado como Tipo J en los ejemplos que siguen para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	15.50	31.44	15.09
Airflex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset NOZ	12.20	3.00	24.59	11.80
Bicarbonato de Sodio	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Agua			573.52	275.29
	12	100	833.33	400

Recubrimiento, mencionado como Tipo K en los siguientes ejemplos para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	15.50	31.44	15.09
Airflex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset NFS	36.70	3.00	8.17	3.92
Bicarbonato de Sodio	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53

Q2-5211	100.00	0.20	0.20	0.10
Agua			589.94	283.17
	12	100	833.33	400

Debe notarse que los recubrimientos mencionados pueden usarse en una variedad de textiles incluyendo seda y nylon. Adicionalmente, el siguiente recubrimiento puede emplearse para nylon/lycra y sustratos de seda cuando se utilizan tintes ácidos.

Recubrimiento, usado para telas de Nylon/Lycra y seda con conjuntos de tintes ácidos

ORDEN DE ADICIÓN DE LOS INGREDIENTES		% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
5	Reten 294LS	17.95	25.00	139.28	452.62
2	AirFlex 540	55.27	100.00	181.26	589.06
3	VS475	10.00	20.00	200.00	649.97
4	Q2-5211	100.00	2.70	2.70	8.77
		1.00	0.00	0.00	0.00
		1.00	0.00	0.00	0.00
1	Agua			707.60	2299.58
		12	147.7	1230.83	4000

La solución de recubrimiento y embebido puede verterse conjuntamente como se describe más adelante. La fórmula separada de fijación de tinte ácido (solución de embebido, sin solución de recubrimiento) incluye agua desionizada en el rango de alrededor de 30-90%, pero más deseablemente en alrededor de 83% en peso, sulfato de amonio en el rango de alrededor de 30 a 40% de sólidos totales, urea en el rango de alrededor de 50 a 70% de sólidos, y un tensioactivo opcional en el rango de alrededor de 0.1-1.0, como Surfyno 465, con 0.2% en peso. La fórmula de fijación del tinte ácido ya descrita (solución de embebido ácida) usada con un recubrimiento particular, tal como los recubrimientos descritos como similares al Ejemplo preliminar 21 (descritos en la sección de tinte reactivo) o el recubrimiento listado inmediatamente arriba, vertiéndose en el recubrimiento en una relación 50/50 y luego aplicado al sustrato como se describió previamente, en oposición a aplicándose en un paso separado de aplicación. Para el sustrato de seda en particular, el recubrimiento utilizado se combinó en una relación 50/50 con la solución de embebido ácida. Alternativamente, el recubrimiento y la solución de embebido pueden combinarse, como en la formulación descrita más adelante.

Recubrimiento, usado para sustratos de telas de Nylon/Lycra y seda, con conjuntos de tintes ácidos, incluyendo el recubrimiento preliminar y la solución de embebido

ORDEN DE ADICIÓN DE LOS INGREDIENTES ANOTADOS POR NÚMERO	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
7 CP7091RV	49.3	15.5	31.4	19.51
4 AirFlex 540	55.17	34	61.6	38.25
6 PrintRite	43.5	34	78.2	48.51
5 Varisoft 475	10	20.4	204.0	126.62
3 Sulfato de Amonio	100	7	7.0	4.34
2 Urea	95	5	5.3	3.27
1 Agua			584.4	362.75
	12.00	116	966.67	600

Ejemplos de Tinte Reactivo

Ejemplo 1

En este y en los siguientes ejemplos, se evaluaron muestras de tela de 11 por 15 pulgadas. En Ejemplo 1, las muestras se recubrieron primero y luego se embebieron. En particular, la tela se recubrió primero mediante un procedimiento de inmersión y exprimido/engomado como se ha descrito previamente, empleando el recubrimiento A y después se secó en un horno de aire forzado a 100°C durante 30 segundos. A continuación de este paso, la muestra de tela se embebió en un método de inmersión y exprimido/engomado usando la solución de embebido C y se secó nuevamente en el horno a 100°C durante 30 segundos. Para cada ejemplo (salvo lo anotado en contrario) se ensayaron cuatro hojas de muestra de tela. Con el fin de obtener buenos atributos de mano, la meta para el levantamiento seco porcentual estuvo entre 7 y 9. El levantamiento seco porcentual se calculó de acuerdo con la siguiente serie de ecuaciones. Estas ecuaciones se describen en Wellington Sears Handbook of Industrial Textiles, por Sabit Adanur, PH.D., copyright 1995, página 179.

Levantamiento Húmedo (%) = Peso de la formulación de levantamiento X 100

Peso de la tela seca

Adición (%) = Concentración de Formulación (%) X Levantamiento Húmedo (%)

A partir de esto se utilizó la siguiente ecuación para llegar a los valores en las tablas de % de levantamiento.

% Levantamiento seco = (Peso Húmedo/Base) X 100) – 100 X % de Sólidos (TS)

Resultados del Ejemplo 1

OBJETIVO: EMBEBER TELA DE POPELINA DE ALGODÓN UTILIZANDO UN TIPO A DE RECUBRIMIENTO Y SOLUCIÓN DE EMBEBIDO SEPARADA. T.S. * DE 11.6 EN PORCENTAJE			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	14.1	24.29	8.4
2	14.1	24.21	8.4
3	14.3	24.74	8.5
4	14.3	25.28	9.0

*T.S. representa los sólidos totales (porcentaje), BW representa el Peso Base.

Ejemplo 2

En este ejemplo, las muestras de tela se embebieron primero utilizando solución de embebido Tipo C y luego se recubrieron con Recubrimiento Tipo B empleando los procedimientos descritos en el Ejemplo previo 1.

OBJETIVO: EMBEBER POPELINA DE ALGODÓN UTILIZANDO TIPO B con T.S. 11.6/T.S. 10.6						
	Paso de Embebido			Paso de Recubrimiento T.S. 10.6		
MUESTRA #	BW en g/m^2	Peso Húmedo en g	% Levantamiento Seco	BW en g/m^2	Peso Húmedo en g	% Levantamiento Seco
1	10.85	22.71	12.6	12.42	22.20	8.4
2	10.87	22.88	12.7	12.38	21.35	7.7
3	10.8	22.16	12.2	12.34	22.22	8.5
4	10.9	22.46	12.3	11.74	20.94	8.3

Ejemplo 3

En este ejemplo las muestras de tela se embebieron únicamente con la solución Tipo C.

OBJETIVO: EMBEBER POPELINA DE ALGODÓN CON SOLUCIÓN TIPO C CON T.S. DE 12			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.83	21.92	11.8
2	10.58	21.63	12.1
3	9.69	19.75	12.1
4	9.7	20.6	12.9

Ejemplo 4

En este ejemplo las muestras de tela se recubrieron únicamente con recubrimiento Tipo D.

OBJETIVO: RECUBRIR MUESTRAS DE TELA ÚNICAMENTE CON TIPO D/ T.S. 10.6			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	9.73	18.46	9.5
2	9.84	18.54	9.3
3	10.73	20.79	9.9
4	10.76	20.93	10.1

Ejemplo 5

En este ejemplo las muestras de tela se recubrieron con la solución Combo Tipo E.

OBJETIVO: TRATAR TELAS CON SOLUCIÓN COMBO/T.S. 11.4, TIPO E			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.97	21.14	10.6
2	10.74	20.47	10.3
3	10.75	20.62	10.5

Ejemplo 6

En este ejemplo las muestras de tela se recubrieron con recubrimiento Tipo F.

OBJETIVO: RECUBRIMIENTO TIPO F; DYESET NOZ Y T.S. 11.1			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.84	21.7	11.1
2	11.02	21.29	10.3
3	10.87	21.26	10.7

Ejemplo 7

En este ejemplo las muestras de tela se recubrieron con recubrimiento Tipo G.

OBJETIVO: RECUBRIMIENTO TIPO G; DYESET NSF Y T.S. 11.68

#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.84	21.1	11.1
2	10.85	20.7	10.6
3	10.77	20.7	10.8

Ejemplo 8

En este ejemplo las muestras de tela se trataron con el recubrimiento Tipo H.

OBJETIVO: TIPO H/DYESET CONC. T.S. 11.2			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.86	21.1	10.5
2	10.86	21.3	10.6
3	10.86	20.6	10.4

Ejemplo 9

En este ejemplo las muestras de tela se trataron con el recubrimiento Tipo I.

OBJETIVO: TIPO I/CONC. T.S. 11.4			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.6	20.9	11.1
2	10.9	21.4	10.9
3	10.8	21.2	10.9

Ejemplo 10

En este ejemplo las muestras de tela se trataron con el recubrimiento Tipo J.

OBJETIVO: TIPO J/NOZ. T.S. 11			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.98	21.4	10.5
2	10.78	21.2	10.6
3	10.72	21.73	10.2

Ejemplo 11

En este ejemplo las muestras de tela se trataron con el recubrimiento Tipo K.

OBJETIVO: TIPO K/NFS			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	12.2	24.1	11.7
2	12.2	23.8	11.4
3	10.7	20.8	11.3

Resultados de los Ejemplos de Tinte Reactivo

Cada una de las muestras se expusieron en la mitad de su área a un iluminante D65/10° (luz de día estándar) para determinar si ocurría algún amarillamiento. También se imprimió una muestra de cada una empleando la impresora TX-1500 de Encad y un componente de tinta disponible de Kimberly-Clark Printing Technology, Inc. de Escondido, California bajo las designaciones 17960-17970. Antes de la impresión, la muestra de tela se laminó primero en un respaldo como se ha descrito previamente en el primer conjunto de ejemplos. Los ejemplos de tintes reactivos usados incluían azul reactivo 49 y negro 5 disponibles de compañías tales como DyStar y BASF Corporation. Los componentes de tinte reactivos utilizaron sulfonas de vinilo y monoclorotriazinas.

Puesto que los tintes reactivos no se inyectan típicamente a chorro debido al nivel de particulados y otros componentes de sales en los tintes se desarrolló componente de tinte para ensayar con los recubrimientos. Se supone que otros componentes de tinte podrían usarse también en conjunción con los recubrimientos, tales como los tintes disponibles de Ciba. Las muestras tinturadas se secaron de un día para otro en la oscuridad.

Se demostró que Tipo A solamente trabajó bien después del vaporeo. La exposición del Tipo A al lavado con agua fue aceptable antes del vaporeo pero el lavado con detergente demostró desteñido considerable. Tipo B demostró trabajar bien sin vaporeo pero tuvo algunos problemas de redeposición sobre la tela. Tipo C demostró tener el mayor desteñido de todas las muestras ensayadas sin vaporeo y tener una apariencia visualmente deteriorada. Luego de vaporizar, los resultados para Tipo C mejoraron mucho. Tipo D demostró resultados positivos a través de todas las muestras pero falló en el ensayo de mancha de agua y muestras impresas. Solamente después de lavar y/o luego del vaporeo y lavado la muestra Tipo D pasó el ensayo de mancha de agua. Tipo E demostró resultados muy aceptables, ocurriendo el manchado de agua únicamente en la muestra impresa. Tipo E demostró resultados

deficientes en lavado con detergente sin ningún paso de procesamiento posterior. Tipo F demostró apariencias visuales positivas como lo hicieron las muestras Tipo H. Las muestras de Tipo G no pasaron la mayor parte de las pruebas. Los Tipos I, J y K demostraron cada uno relativamente los mismos resultados positivos, aunque Tipo K mostró un mejor desempeño en términos de apariencia y lavabilidad.

Para los propósitos de esta solicitud el ensayo de mancha de agua comprendió el Método de 104-1994 AATTC. En esencia, en este ensayo se pone una gota de agua sobre un sustrato y luego se frota hacia abajo utilizando una varilla de vidrio. A continuación se observa el sustrato para ver si quedó una mancha de agua luego de que ésta última seque. Si aparece un círculo blanco, entonces se considera que se ha dejado una mancha de agua.

Pueden emplearse otros componentes de tinta de tinte con estos recubrimientos incluyendo los disponibles de Kimberley-Clark Printing Technology, Inc. bajo las designaciones TXCR-500 Negro, TXCR-520 Rojo, TXCR-523 Rojo Medio, TXCR-526 Escarlata, TXCR-530 Anaranjado, TXCR-540 Amarillo, TXCR-545 Amarillo Oro, TXCR-550 Verde, TXCR-560 Turquesa, TXCR-565 Turquesa Medio, TXCR-570 Azul y TXCR-580 Gris. Estos componentes de tinta de tinte reactivo se ensayaron con los recubrimientos mencionados imprimiéndolos con una impresora Colorspan DM XII de 12 colores/600 dpi.

Alternativamente, en lugar de usar componentes de tinte reactivo, pueden utilizarse componentes de tinta de tinte ácido con soluciones fijadoras de tinte ácido (soluciones de embebido). Sustratos textiles que pueden emplear los componentes de tinte ácido incluyen algunos como aquellos con fibras que son tinturables con tintes ácidos, hebras continuas mezcladas, siempre y cuando la relación sea como mínimo del 15% entre nylon y otros materiales tales como lycra y poliamidas. Dichos componentes de tinte ácido se encuentran disponibles de Kimberly-Clark Printing Technology, Inc. bajo la designación 17972-17975. Componentes adicionales de tinte ácido se hallan disponibles de Kimberley-Clark Printing Technology, Inc. bajo las designaciones 7287-20-2 Negro, 7287-27-2 Gris, 6869-184-5 Violeta, 7287-21-1 Azul, 7287-24-2 Azul Claro, 7287-10-1 Turquesa y 7287-25-1 Verde, 6869-186-3B Magenta, 7287-24-1 Magenta Claro, 6869-184-10 Escarlata, 7287-15-1 Anaranjado, 7287-6-1 Amarillo. Dichas tintas se ensayaron con los recubrimientos ya descritos utilizando la impresosa Colorspan DM XII previamente descrita.

Utilizando dichos compuestos de tinte, se provee una solución de inyección de tinta a un proceso convencional de impresión de pantalla

que emplea tintes ácidos y un sustrato tratado. Proporcionando una alternativa digital a este mercado se reducirá sensiblemente el costo de manufactura de los textiles y permitirá que se elaboren más productos hechos al gusto del consumidor.

Ejemplos de Tinte Ácido

Se preparó una tela de nylon recubierta y embebida en una forma similar a las muestras de tela previamente descritas y se imprimieron con una impresión de prueba sobre la muestra seca. La muestra se lavó en agua caliente sin desteñido aparente del tinte.

En un segundo conjunto de ejemplos, componentes de tinte ácido se utilizaron sobre muestras de tela charmeuse de seda y Nylon/Lycra. Como en los ejemplos anteriores, se cortaron muestras de hoja de tela de 11 por 15 pulgadas y la tela se ensayó luego de acuerdo con varios recubrimientos de ensayo. Debe anotarse que estas telas no se pueden imprimir directamente mientras estén sin recubrir. Los resultados para sólo lavado demuestran un Delta E de 40 para nylon/lycra y un Delta E de 35 para la charmeuse de seda sin tratamiento posterior. No obstante, después del tratamiento posterior para telas recubiertas los valores de Delta E fueron ambos de alrededor de 1.5 o menos. El tratamiento posterior consistió en vaporear y, en particular, vaporear las telas entre alrededor de 105°C a 125°C, alrededor de durante 25 minutos para seda y 45 minutos para nylon/lycra. Los datos para la seda se describen en la siguiente Tabla 7.

Tabla 7

TINTAS ÁCIDAS SOBRE SEDA EMPLEANDO TINTAS DE KIMBERLY-CLARK PRINTING TECHNOLOGY (COLOR)	DELTA E VAPOREADO	DELTA E VAPOREADO Y LAVADO
Amarillo	8.9	0.5
Anaranjado	7.1	0.5
Escarlata	17.2	1.5
Escarlata Medio	8.3	2.4
Magenta	19.2	1.5
Verde	6.2	1.3
Turquesa Medio	4.1	1.5
Turquesa	4.9	0.7
Azul	5.3	1.9
Violeta	6.6	0.8
Gris	3.4	1.2
Negro	4.5	0.4

Ejemplos de Tinta de Pigmento

Debe reconocerse también que pueden utilizarse además formulaciones de tinta pigmentada en conjunción con las formulaciones de solución de recubrimiento y embebido. Es particularmente deseable usar formulaciones de tinta pigmentada disponibles de Kimberley-Clark Printing Technology, Inc. bajo las designaciones 17978-17979. Ejemplos de dispersiones de pigmento incluyen Cian Acryjet, magenta, amarillo y negro disponibles de Rohm & Haas Corporation.

Las formulaciones de tratamiento/recubrimiento y los métodos que son objeto de esta invención proporcionan sustratos textiles imprimibles con inyección de tinta que poseen características de impresión y calidad de imagen, una mejora notoria del color, calidad y densidad del color, capacidad de retención de tinta y propiedades de resistencia al agua y los detergentes. Dichas formulaciones pueden usarse para preparar artículos de manufactura como se describió anteriormente. Aunque la invención se ha descrito en detalle con referencia particular a una modalidad preferida de la misma, debe entenderse que se pueden hacer muchas modificaciones, adiciones y eliminaciones a ella sin apartarse del espíritu y la órbita de la invención como se expone en las siguientes reivindicaciones.

REIVINDICACIONES

Lo que se reivindica es:

1. Una formulación de recubrimiento acuoso que contiene sólidos, para mejorar la visualización de la imagen y la retención de tintas a base de tinte reactivo, que comprende:
   a) un polímero catiónico o copolímero,
   b) un suavizante de tela,
   c) urea, y
   d) un ingrediente seleccionado de bicarbonato de sodio, carbonato de sodio o sus combinaciones.

2. La formulación de recubrimiento acuoso de la reivindicación 1 donde dicho polímero catiónico o copolímero se encuentra presente en una cantidad entre alrededor de 5 a 95% de los sólidos totales.

3. La formulación de recubrimiento acuoso de la reivindicación 1 donde dicho suavizante de tela se halla presente en una cantidad entre alrededor de 5 a 20% de los sólidos totales.

4. La formulación de recubrimiento acuoso de la reivindicación 1 que comprende además un aglutinante de látex.

5. La formulación de recubrimiento acuoso de la reivindicación 4 donde dicho aglutinante de látex se halla presente en una cantidad entre alrededor de 0 a 80% de los sólidos totales.

6. La formulación de recubrimiento acuoso de la reivindicación 1 donde el bicarbonato de sodio se halla presente en una cantidad entre alrededor de 3 y 10% de los sólidos totales.

7. La formulación de recubrimiento acuoso de la reivindicación 1 donde la urea se halla presente en una cantidad entre alrededor de 5 y 12% de los sólidos totales.

8. La formulación de recubrimiento acuoso de la reivindicación 1 que incluye además aditivos seleccionados del grupo que comprende agentes humectantes, antiespumantes y tensioactivos.

9. La formulación de recubrimiento acuoso de la reivindicación 8 donde dichos aditivos se encuentran presentes en una cantidad entre alrededor de 0.1 y 1% de los sólidos totales.

10. Una solución de embebido acuoso, para mejorar la visualización de la imagen y la retención de tintas a base de tinte reactivo, que comprende;

a) bicarbonato de sodio, carbonato de sodio o una combinación de ellos,
b) urea.

11. La solución de embebido acuoso de la reivindicación 10 donde el bicarbonato de sodio, el carbonato de sodio, o combinación de los mismos, se encuentra presente en una cantidad entre alrededor de 30 y 40% de los sólidos totales.

12. La solución de embebido acuoso de la reivindicación 10 donde dicha urea se encuentra presente en una cantidad entre alrededor de 50 y 70% de los sólidos totales.

13. La solución de embebido acuoso de la reivindicación 10 que incluye además aditivos seleccionados del grupo que comprende agentes humectantes, antiespumantes y tensioactivos.

14. Una formulación de recubrimiento acuoso que contiene sólidos, para mejorar la visualización de la imagen y la retención de tintas a base de tinte ácido, que comprende:

a) un polímero catiónico o copolímero,
b) un suavizante de tela,

c) urea, y
d) sulfato de amonio.

15. La formulación de recubrimiento acuoso de la reivindicación 14 donde dicho polímero catiónico o copolímero se encuentra presente en una cantidad entre alrededor de 5 a 95% de los sólidos totales.

16. La formulación de recubrimiento acuoso de la reivindicación 14 donde dicho suavizante de tela se halla presente en una cantidad entre alrededor de 5 a 20% de los sólidos totales.

17. La formulación de recubrimiento acuoso de la reivindicación 14 que comprende además un aglutinante de látex.

18. La formulación de recubrimiento acuoso de la reivindicación 17 donde dicho aglutinante de látex se encuentra presente en una cantidad entre alrededor de 0 a 80% de los sólidos totales.

19. La formulación de recubrimiento acuoso de la reivindicación 14 donde la urea se encuentra presente en una cantidad entre alrededor de 2 y 5% de los sólidos totales.

20. La formulación de recubrimiento acuoso de la reivindicación 14 donde el sulfato de amonio se halla presente en una cantidad entre alrededor de 5 y 10% de los sólidos totales.

21. La formulación de recubrimiento acuoso de la reivindicación 14 que incluye además aditivos seleccionados del grupo que comprende agentes humectantes, antiespumantes y tensioactivos.

22. La formulación de recubrimiento acuoso de la reivindicación 21 donde dichos aditivos se encuentran presentes en una cantidad entre alrededor de 0.1 y 1% de los sólidos totales.

23. Una solución de embebido acuoso, para mejorar la visualización de la imagen y la retención de tintas a base de tinte ácido, que comprende:
a) sulfato de amonio,
b) urea.

24. La solución de embebido acuoso de la reivindicación 23 donde dicho sulfato de amonio se encuentra presente en una cantidad entre alrededor de 30 y 40% de los sólidos totales.

25. La solución de embebido acuoso de la reivindicación 23 donde dicha urea se halla presente en una cantidad entre alrededor de 50 y 70% de los sólidos totales.

26. La solución de embebido acuoso de la reivindicación 23 que incluye además aditivos seleccionados del grupo que comprende agentes humectantes, antiespumantes y tensioactivos.

27. Un método para tratar un sustrato con el fin de mejorar la adhesión, la resistencia del color y la resistencia de lavado de una tinta, a base de tinte reactivo, impresa con inyección de tinta sobre el sustrato, que se expondrá a un paso de tratamiento posterior a continuación de la impresión, método que comprende:

a) proveer un sustrato,

b) tratar el sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero, un suavizante de tela, urea y un ingrediente seleccionado de bicarbonato de sodio, carbonato de sodio o una combinación de los mismos.

28. El método de la reivindicación 27 donde dicho polímero catiónico o copolímero se halla presente en dicha formulación de recubrimiento acuoso en una cantidad entre alrededor de 5 a 95% de los sólidos totales.

29. El método de la reivindicación 27 donde dicho suavizante de tela está presente en dicha formulación de recubrimiento acuoso en una cantidad entre alrededor de 5 a 20% de los sólidos totales.

30. El método de la reivindicación 27 donde dicha formulación de recubrimiento acuoso incluye además un aglutinante de látex.

31. El método de la reivindicación 30 donde dicho aglutinante de látex se halla presente en dicha formulación de recubrimiento acuoso en una cantidad entre alrededor de 0 a 80% de los sólidos totales.

32. El método de la reivindicación 27 donde dicha urea se encuentra presente en dicha formulación de recubrimiento acuoso en una cantidad entre alrededor de 5 a 12% de los sólidos totales.

33. El método de la reivindicación 27 donde dicho bicarbonato de sodio, carbonato de sodio, o una combinación de los mismos, está presente en dicha formulación de recubrimiento acuoso en una cantidad entre alrededor de 3 a 10% de los sólidos totales.

34. Un artículo producido mediante el método de la reivindicación 27.

35. Un método para producir un sustrato impreso con el fin de mejorar la adhesión, la resistencia del color y la resistencia de lavado de una tinta, a base de tinte reactivo, impresa con inyección de tinta sobre el sustrato, método que comprende: 00202

a) proveer un sustrato,
b) tratar el sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero, un suavizante de tela, y un ingrediente seleccionado de bicarbonato de sodio, carbonato de sodio o combinaciones de los mismos,
b) secar el sustrato,
c) imprimir el sustrato con una tinta a base de tinte reactivo,
d) tratar posteriormente el sustrato impreso del paso d).

36. Un método para tratar un sustrato impreso con el fin de mejorar la adhesión, la resistencia del color y la resistencia de lavado de una tinta, a base de tinte reactivo, impresa con inyección de tinta sobre el sustrato, que será expuesto a un tratamiento posterior después de la impresión, método que comprende:

a) proveer un sustrato,
b) tratar el sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero y un suavizante de tela,
c) tratar el sustrato del paso b) con una solución de embebido acuoso de urea y un ingrediente seleccionado de bicarbonato de sodio, carbonato de sodio y combinaciones de los mismos.

37. Un artículo producido mediante el método de la reivindicación 36.

38. Un método para producir un sustrato impreso con el fin de mejorar la adhesión, la resistencia del color y la resistencia al lavado de una tinta a base de tinte reactivo, impresa con inyección de tinta sobre el sustrato, método que comprende los pasos de:

a) proveer un sustrato,
b) tratar un sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero, un suavizante de tela,
c) tratar el sustrato del paso b) con una solución de embebido de urea y un ingrediente seleccionado

de bicarbonato de sodio, carbonato de sodio o combinaciones de los mismos,

d) secar el sustrato,

e) imprimir el substrato con una tinta a base de tinte reactivo, y

f) tratar posteriormente el sustrato impreso de paso e).

39. Un sustrato impreso producido de acuerdo con el método de la reivindicación 35.

40. Un sustrato impreso producido de acuerdo con el método de la reivindicación 38.

41. Un método para tratar un sustrato con el fin de mejorar la adhesión, la resistencia del color y la resistencia al lavado de una tinta a base de tinte ácido, impresa con inyección de tinta sobre el sustrato, y sustrato que se expondrá a un paso de tratamiento posterior después de la impresión, método que comprende los pasos de:

a) proveer un sustrato,

b) tratar un sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero, un suavizante de tela, urea y sulfato de amonio.

42. El método de la reivindicación 41 donde dicho polímero catiónico o copolímero está presente en una cantidad entre alrededor de 5 a 95% de los sólidos totales.

43. El método de la reivindicación 41 donde dicho suavizante de tela se halla presente en una cantidad entre alrededor de 5 a 20% de los sólidos totales.

44. El método de la reivindicación 41 donde la formulación de recubrimiento acuoso comprende además un aglutinante de látex.

45. El método de la reivindicación 44 donde dicho aglutinante de látex se encuentra presente en una cantidad entre alrededor de 0 a 80% de los sólidos totales.

46. El método de la reivindicación 41 donde la urea se halla presente en una cantidad entre alrededor de 2 a 5% de los sólidos totales.

47. El método de la reivindicación 41 donde el sulfato de amonio está presente en una cantidad entre alrededor de 5 a 10% de los sólidos totales.

48. Un artículo producido mediante el método de la reivindicación 41.

49. Un método para tratar un sustrato con el fin de mejorar la adhesión, la resistencia del color y la resistencia al lavado de una tinta a base de tinte ácido, impresa con inyección de tinta sobre el sustrato, y sustrato que se expondrá a un paso de tratamiento posterior después de la impresión, método que comprende los pasos de:

a) proveer un sustrato,
b) tratar el sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero y un suavizante de tela,
c) tratar el sustrato del paso b) con una solución de embebido acuoso de urea y sulfato de amonio.

50. Un método para producir un sustrato impreso con el fin de mejorar la adhesión, la resistencia del color y la resistencia al lavado de una tinta a base de tinte ácido, impresa con inyección de tinta sobre el sustrato, método que comprende los pasos de:

a) proveer un sustrato,
b) tratar el sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero, un suavizante de tela, urea y sulfato de amonio,
c) secar el sustrato,
d) imprimir el sustrato con una tinta a base de tinte reactivo,
e) tratar posteriormente el sustrato impreso del paso d).

51. Un sustrato impreso producido de acuerdo con el método de la reivindicación 50.

52. Un método para producir un sustrato impreso con el fin de mejorar la adhesión, la resistencia del color y la resistencia al lavado de una tinta a base de tinte ácido, impresa con inyección de tinta sobre el sustrato, método que comprende los pasos de:

a) proveer un sustrato,
b) tratar el sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero, un suavizante de tela,

c) tratar el sustrato del paso b) con una solución de embebido acuoso de urea, y un ingrediente seleccionado de bicarbonato de sodio, carbonato de sodio o combinaciones de los mismos,

d) secar el sustrato,

e) imprimir el sustrato con una tinta a base de tinte reactivo, y

f) tratar posteriormente el sustrato impreso del paso d).

00205

53. Un sustrato impreso producido de acuerdo con el método de la reivindicación 52.

Extracto

Un método para producir un sustrato impreso con el fin de mejorar la adhesión, la resistencia del color y la resistencia al lavado de tintas a base de tinte reactivo o ácido impresas con inyección de tinta sobre el substrato, el método incluye los pasos de proveer un sustrato, tratar el sustrato con una formulación de recubrimiento acuoso que comprende un polímero catiónico o copolímero, un suavizante de tela, tratar el sustrato del paso con una solución de embebido acuoso de urea y un ingrediente seleccionado de bicarbonato de sodio, carbonato de sodio o sus combinaciones, o sulfato de amonio, secar el sustrato, imprimir el sustrato con tinta a base de tinte ácido o reactivo, dependiendo del recubrimiento y tratar posteriormente el sustrato.

ES TRADUCCIÓN FIEL Y COMPLETA DEL DOCUMENTO ANEXO TERMINADA ESTE 11 DE ABRIL, 2001.

Case # 15260
COLOMBIA

205

00203

CERTIFICATION

STATE OF WISCONSIN)
) SS
COUNTY OF WINNEBAGO)

I hereby certify that the attached papers constitute an identical copy of the original of U. S. Patent Application corresponding to Serial No. **60/163,741** for

COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM

filed on **November 4, 1999**, assigned to Kimberly-Clark Worldwide, Inc. and I further certify that Kimberly-Clark Worldwide, Inc. is a corporation organized and existing under the laws of the State of Delaware, United States of America.

Dated this 8th day of January, 2001, at Neenah, Wisconsin, United States of America.

Melissa A. Blob

Melissa A. Blob, Notary Public
My commission expires: August 1, 2004

(No Legalization)

PA 318680

00267

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

October 18, 2000

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***60/163,741***
FILING DATE: ***November 04, 1999***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

T. Lawrence

T. LAWRENCE
Certifying Officer

October 18, 2000

This is to inform you that the document requested in your order dated 10-11-2000 is a true reproduction of the official office record copy of that document:

60163741 CERTIFIED PATENT APP AS FILED-PSF 10

☐ The enclosed Patent Application as Filed is a reproduction of the application as originally filed and has been recorded using high quality scanning or microfilm equipment. Copies of page/papers that were not scannable have not been included, nor have pages/papers received after the original filing date. Copies of these pages/papers may be ordered separately.

☑ The enclosed document is a reproduction of the best available source of the official office record copy of that document.

If you have any questions or need additional information, please contact our Customer Service Department.

Mailing Address:
U.S. Patent and Trademark Office
Office of Public Records, Customer Service
Crystal Gateway 4, Suite 300
Washington DC 20231

Delivery Address:
U.S. Patent and Trademark Office
Office of Public Records, Customer Service
1213 Jefferson Davis Highway, Suite 300
Arlington VA 22202

For faster processing of new orders, please specify as appropriate:
Box 9 (Copy Sales) for Uncertified copies, or Box 10 for Certified copies of PTO Documents

Voice: (703) 308-9726 Fax: (703) 308-7048 E-Mail: PTCS@USPTO.GOV or Certdiv@USPTO.GOV

Ref:TL 315650

11/04/99 JC552 U.S. PTO

208

JC552 U.S. PTO 09/163741 11/04/99

00203

In the United States Patent and Trademark Office

Applicants:	Alison S. Bagwell et al.	Docket No.:	15260
Serial No.:		Group No.:	
Filed:	November 4, 1999	Examiner:	
For:	COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM		
Express Mail	EL188517280US	Date:	November 4, 1999

Cover Sheet
Provisional U.S. Patent Application
Plural Inventors

BOX PROVISIONAL APPLICATION
ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the above-identified PROVISIONAL U.S. patent application in the name of Alison S. Bagwell, residing at 4310 Wellington Place, Cumming, GA 30040; and in the name of Kelly Dean Branham, residing at 3337 Rae Place, Lawrenceville, GA 30044; and in the name of Mary E. Farris, residing at 5475 Memphis Street, Cumming, GA 30040; and in the name of Leonard Eugene Zelazoski, residing at 3785 Junction Drive, Kennesaw, GA 30144.

Enclosed are:

1. 152 pages of specification.
2. An unexecuted Combined Declaration and Power of Attorney identifying the inventors and their current addresses.
3. Three (3) sheets of informal drawings.
4. This Transmittal Letter, in duplicate.

In accordance with 37 C.F.R. 1.16(k), please charge Kimberly-Clark Worldwide, Inc. deposit account number 11-0875 the $150.00 basic fee for filing the present PROVISIONAL application.

Please address all correspondence to: Steven D. Flack, Kimberly-Clark Worldwide, Inc., Patent Department, 401 North Lake Street, Neenah, Wisconsin 54956.

60163741.110499

209 20

0021

The undersigned may be reached at: (770) 587-8848.

Respectfully submitted,

ALISON SALYER BAGWELL ET AL.

By: _____

Steven D. Flack
Registration No.: 40,608

CERTIFICATE OF MAILING

I, Steven D. Flack, hereby certify that this patent application having affixed thereto an Express Mail mailing number of EL188517280US and addressed to BOX PROVISIONAL APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231, is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on November 4, 1999.

By: _____

Steven D. Flack

60163741.110499

210

PATENT

In the United States Patent and Trademark Office

In re application of:	Alison S. Bagwell et al.	Docket No.:	15260
Serial No.:		Examiner:	
Filed:	November 4, 1999	Group No.:	
For:	COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM		
Express Mail:	EL188517280US	Date:	November 4, 1999

0821

LETTER

BOX PROVISIONAL APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This application is being filed without a Declaration or Oath or an Assignment by the Applicant(s). A Combined Declaration and Power of Attorney and an Assignment will be submitted after Applicant(s) have received a "Notice to File Missing Parts of Application."

Respectfully submitted,

KIMBERLY-CLARK WORLDWIDE, INC.
401 North Lake Street
Neenah, Wisconsin 54956

Steven D. Flack
Registration No. 40,808
Telephone: (770) 587-8646

CERTIFICATE OF MAILING (37 C.F.R. 1.8a)

I, Steven D. Flack, hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on November 4, 1999 with sufficient postage as first class mail in an envelope addressed to the Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

By: _____
Steven D. Flack

60153744.110499

EXPRESS MAIL N . EL188517280US CASE NO. 15280

PROVISIONAL APPLICATION

ENTITLED

COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, ARTICLES PRODUCED THEREFROM

IN THE NAMES OF

Alison Salyer Bagwell
4310 Wellington Place
Cumming, GA 30040

Kelly Dean Branham
3337 Rae Place
Lawrenceville, GA 30044

Mary E. Farris
5475 Memphis Street
Cumming, GA 30040

Leonard Eugene Zelazoski
3785 Junction Drive
Kennesaw, GA 30144

I, Steven D. Flack, hereby certify that this patent application having affixed thereto an Express Mail mailing number of EL188517280US and addressed to BOX PROVISIONAL APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231, is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on November 4, 1999.

By: _____
Steven D. Flack

Date: November 4, 1999

"Express Mail" Mailing Label Number EL188617280US
Date of Deposit November 4, 1999

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office To Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Steven B. Fish
(Typed or printed name of person mailing paper or fee)

(Signature of person mailing paper or fee)

60163741 - 110499

COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM

Field of the Invention

The present invention relates to treated ink jet textile fabric substrates which are intended to receive images when printed by ink jet printing devices. In particular, the present invention relates to coating for treating substrates for ink jet printing including imbibing solution for enhanced image visualization and retention, method for treating said substrates, and articles produced therefrom. Such methods facilitate the use of such substrates in commonly available ink jet or laser printing devices, such as wide or narrow format ink jet and laser printers.

Background of the Invention

Ink jet printing is a non-impact and non-contact printing method in which an electronic signal controls and directs droplets or a stream of ink that can be deposited on a wide variety of substrates. Ink jet printing is extremely versatile in terms of the variety of substrates that can be treated, as well as the print quality and the speed of operation that can be achieved. In addition, ink jet printing is digitally controllable. For these reasons, ink jet methodology has been widely adopted for industrial marking and labeling. In addition, ink jet methodology has also found widespread use in architectural and engineering design applications, medical imaging, office printing (of both text and graphics), geographical imaging systems (e.g., for seismic data analysis and mapping),

signage, in display graphics (e.g., photographic reproduction, business and courtroom graphics, graphic arts), and the like. Finally, ink jet printing has now also been used to create an image on a variety of textile substrates. The use of ink-jet printing to create an image on textile fabrics has allowed for the rapid visualization of an aesthetic design on fabric without the use of expensive and often wasteful screen printing techniques. Such ink-jet printing methodology allows a designer or production facility to visualize a finished design in significantly less time than is usually necessary to burn a screen image of the design by typical screen printing methodology.

Both dyes and pigments have been used as colorants for such ink jet ink formulations. However, such materials do not always adhere well to substrates to which the ink is applied. For example, dyes may dissolve upon a substrate's contact with water. Thus images applied employing ink jet methodology may tend to run or smear upon repeated contact, or may be actually removed from the printed surface if exposed to substantial quantities of aqueous media (e.g., if an ink jet printed article is laundered). Moreover, images applied employing ink jet methodology may also tend to fade or washout upon prolonged exposure to visible, ultraviolet and/or infrared light. Furthermore, dyes applied to textile substrates may experience severe dye bleed upon application to the substrate. Finally, the color intensity of the image printed on a textile substrate using ink-jet methodology is often lacking in vibrancy.

The nature of textile substrates also poses specific problems when printing or imaging via ink jet print methods, which are not found with common ink jet substrates (e.g. paper or coated paper). For instance, the textile fibers can vary widely in composition, with each composition presenting a unique set of conditions for acceptable printing of the substrate. For example, cotton substrates may be very absorbent, such as in the case of aqueous-based inks. When ink is ejected from the ink channel of an ink jet printing device, it is rapidly absorbed into the fibers of the cotton substrate. Since these fibers are much larger than the fibers typically found in paper substrates, the color density or appearance of color brightness is significantly diminished due to the lack of retention of the colorant at the surface of the fibers. In addition, bleeding, mottle of the print pattern, and loss of image sharpness or clarity can often result from printing on the textile fabric itself.

Conversely, synthetic fibers such as polyester or nylon may be poorly wet by the aqueous inks and such inks may be only retained in the interstitial spaces between the fibers. This limited ink retention also causes the print-quality related problems outlined above.

6015374.110499

00215

Furthermore, the permanence of the printed image on textile fabrics is often achieved commercially by some post-printing curing process such as heating, steaming, or chemical fixation. These processes tend to be inefficient, requiring further washing and drying steps to remove unfixed colorant from the fabric. It is therefore desirable to enhance the permanence of the printed image on ink jet printable substrates, either in the presence or absence of a post-printing curing process step.

Polymeric materials are typically used commercially to modify the properties of both natural and synthetic textile fibers and substrates. These treatments may alter textile appearance or hand, reduce shrinking, reduce flammability, or alter other properties of the fiber or substrate. Treatments may even be employed to enhance the ease of printing and/or print performance when commercial printing processes, such as rotary screen printing, are employed. For instance, polyethylene oxide has been used to pretreat a starting cloth material so as to create an adequate textile substrate for ink-jet printing. As disclosed in U.S. Patent number 5,781,216 to Haruta et al., the use of polyethylene oxide treated textile substrates are described as being highly capable of providing images of great color depth with sufficient brightness and sharpness, but free of objectionable color bleed. While Haruta discloses such a polyethylene oxide pretreatment with a cationizing agent, to thereby enhance the coloring ability of images, Haruta requires such treatment to thereafter be cured by additional heating, washing and drying steps.

Use of cationic polymers as part of a latex saturant in a hydroentangled fibrous web is disclosed in PCT US 98 12712 to Harris et al., which was published as WO99/00541 on January 7, 1999. As described in WO99/00541, latex saturation is typically followed by a drying step or other curing aids.

Use of imbibing solutions with sodium bicarbonate, sodium carbonate and urea have been known. However, such imbibing solutions are typically used by textile mills in ink pastes along with other additives such as thickeners, and they have not been used in conjunction with coating treatments on the textile substrates themselves prior to being printed. The ink pastes are then rotary screen printed down onto the fabric substrates. However, an ink jet paste delivery system can not be used for ink jet printing because of the physical constraints of the ink jet printer technology. The salts in the pastes will corrode the ink jet printer heads. Use of ink pastes are a also wasteful process. Furthermore, even with the use of such pastes in a convention screen printing process, the process experiences a large amount of dye wash off following printing.

Accordingly, there is still a need in the art for ink jet printable substrate treatment methods which provide for high optical density with a minimum amount of bleeding on the

6015374-1 .110499

substrate during and after imaging from ink jet printers. There is also a need in the art for such ink jet printable substrate treatment methods which can be applied to textile fabric substrates. In this regard, there is still a need in the art for methods for treating fabrics for receiving ink-jet ink formulations, which methods allow for improved colorfastness and color intensity in a wide variety of textile substrates. Finally, there is still a need in the art for such substrates which are not dependent upon an ink curing step for construction.

Summary of the Invention

In accordance with the present invention, it has been discovered that the color density and quality of the printed image, and the adhesion properties and/or colorfastness of ink jet ink formulations when applied to a variety of ink jet printable substrates, can be improved by treating the substrates with coating formulations used in conjunction with imbibing solutions. In particular, a wide array of textile fabric substrates can be treated to improve the colorfastness and washfastness of ink jet ink formulations. The treatment formulations include about 5-95 % cationic polymers or copolymers, and about 5-20% fabric softeners. Alternatively, the formulations may also include about 0-80% of a polymeric latex binder so as to increase washfastness. These percentages are based on solids. Total solids content for the formulations typically range from about 10-50 %, but preferably range from about 12-25 %. In particular, use of the aforesaid coatings in conjunction with an imbibing solution of either sodium bicarbonate or sodium carbonate and urea for reactive dye classes may be used. In an alternate embodiment, use of the above coating formulations in conjunction with an imbibing solution of ammonium sulfate and urea for acid dye classes may be used. The present methods provide a pathway to fixation of dyes, irrespective of chemical class or textile fabric substrate, and do so without the need of any further ink curing process beyond drying under ambient conditions. In addition, efficacy of post printing processes such as steaming or curing may be enhanced by such formulations, reducing dye waste and further enhancing color vibrancy. Also, fixation of pigment or colorant may be enhanced by these formulations.

These and other features and advantages of the present invention will become apparent after a review of the following detailed description of the disclosed embodiments and the appended claims.

216

00217

Brief Description of the Drawings

FIG.1 illustrates exemplary cationic polymers for use in treatment formulations for substrates in accordance with the present inventive methods.

FIG.2 illustrates a schematic view of a dip and squeeze process for treating ink jet printable substrates.

Detailed Description of the Invention

In accordance with the present invention, there are provided methods to improve the adhesion properties and/or colorfastness/color density and washfastness of ink jet printable substrates in the absence of a heating or post treatment curing step, said methods comprising treating a textile substrate with a formulation including cationic polymers or copolymers and fabric softeners. In a preferred method, the method comprises treating a textile substrate with a formulation including about 5-95 % cationic polymers or copolymers, and about 5-20 % fabric softeners. The present invention is further directed to a treated ink jet printable substrate wherein the treatment comprises a formulation of cationic polymers or copolymers and fabric softeners. A preferred embodiment of the present invention is a treated ink jet printable substrate wherein the treatment comprises about 5-95 % cationic polymers or copolymers, and about 5-20 % fabric softeners.

The cationic copolymers function in the formulation to attract and fix oppositely charged anionic dye molecules to the substrates, and in particular, textile fabric substrates. The polymers or copolymers may contain reactive residues or groups capable of crosslinking to the textile fibers, with themselves, or with other components present in the formulation. Such cationic resins may incorporate charge groups in the main polymer chains or polymer backbones, or as side groups in the polymer chains. An exemplary list of the structural formulas of such cationic polymers are illustrated in Fig. 1. These cationic polymers may include but are not limited to polymers and copolymers of diallyldialkyammonium monomers such as diallyldimethylammonium chloride, cationic acrylate and acrylamide such as acryloxyethyldimethylammonium chloride or acrylamidoethyldimethylammonium chloride monomers, quarternized vinylpyridine such as methyl vinylpyridine chloride, and polyalkylamine polymers and copolymers. Co-

6015374.11099

217
0213

monomers in such systems may consist of ones which modify the flexibility, hydrophobicity, or mechanical properties of the polymer molecule. In addition, reactive and/or self-condensing monomers may be included to enhance adhesion to the textile fiber or other components in the formulation. Other examples of cationic polymers with charged groups in the main chain include epihalohydrin-amine polymers such as Reten™ 204 LS and Kymene™ 557 LX polymers of Hercules Incorporated, of Wilmington, Delaware. A specific example of a preferred cationic polymer resin is CP 7091 RV available from ECC International of Roswell, Georgia, with CP 7091 RV being a poly(diallyldimethlammonium chloride-co-diacetone acrylamide).

Suitable fabric softeners which may be used in accordance with the present inventive method include, but are not limited to, Varisoft 222 of the Witco Corporation of Greenwich, Connecticut, Adogen 432 also of the Witco Corporation, Accosoft 550-75 of the Stepan Company of Northfield, Illinois, Alubrasoft Super 100 and Alubrasoft 116 of the BASF Corporation, Specialty Chemicals Division of Mt. Olive, New Jersey, and Ahcovel Base N-62 of ICI Surfactants or Hodgson Texiles Chemical of Mt. Holly, North Carolina. Suitable fabric softeners include those that are cationic or nonionic and provide the attributes of print quality and image brightness to the printed textile substrate. The fabric softener most suitable to a particular textile fabric substrate varies by fabric substrate. For instance, it has been found that the fabric softener Varisoft 222 performs better with cotton/banner fabric samples while Adogen 432 performs better with nylon/lycra samples.

In another embodiment of the present invention, treatments or formulations for ink jet printable substrates, and in particular textile substrates, also include a latex binder in order to further enhance the adhesion and/or waterfastness of colorants on the textile fabric substrates. It has been found that coated ink jet receptive substrates including a latex binder provide high color density and saturation, superior print quality, reduction of wicking or bleeding, and enhanced ink absorption. Furthermore, the coating or treatment formulations provide a waterfast printed image when printing via an ink jet printing process, without the necessity of post-printing curing steps such as heating, steaming, chemical fixation, or radiation. Likewise, the present invention is also directed to a treated ink jet printable substrate wherein the treatment comprises a formulation of cationic polymers or copolymers, fabric softeners, and a latex binder. A preferred embodiment of the present invention is a treated ink jet printable substrate wherein the treatment formulation comprises about 5-95 % cationic polymers or copolymers, about 5-20 % fabric softeners and about 0-80% latex binder.

EDI537441.110499

6015374.11040499

The treatment or coating formulations in this alternate embodiment consist primarily of cationic polymers and copolymers, fabric softeners and a water-insoluble polymer in the form of a latex dispersion or emulsion. In particular, the treating formulation may include about 0-80 % polymeric latex binder depending on the textile fabric substrate. The latex reinforcing polymers may be either nonionic or cationic. By way of example only, the latex materials may include vinylacetate, ethylene-vinylacetate, acrylate, styrene, and styrene-acrylate resins and other cationic or nonionic latexes. These resins may include reactive or self cross-linking groups in addition to inherent cationic functionality.

These formulations may also include other additives which effect the appearance or tactile properties of the finished substrate such as optical brighteners. It should be recognized that all of the stated percentages are based on solids unless otherwise noted. Total solids content for the formulations typically range from about 5-50 %, but preferably range from about 5-32 %. Most preferably the total solids content for the formulations range from about 25-28 %.

Treatment formulations for the textile substrates are made by adding the above components from stock solutions or dispersions, or as solids when appropriate, and mixing to homogeneity. Application of the treatment formulation to the textile substrates may be carried out by any known means to those having ordinary skill in the art. For instance, fabric substrates may be treated by a standard padding (dip and squeeze) method and dried in a forced air oven, although any suitable drying means of textiles known to those skilled in the art may be employed. As can be seen in FIG.2 showing a schematic view of a dip and squeeze process 10 for treating ink jet printable substrates, a textile substrate 20 is unwound from the incoming roll 30 and is then dipped in a saturator tank/bath 40 for sufficient time for it to become saturated with the treating formulation. The textile substrate is then run through a pressurized nip roll set 44 and 48. The pressure on the rolls should be in the range of 10-120 psig but preferably 10-65 psig, depending on the type of textile fabric substrate utilized, and the total solids content of the treatment formulations used. The pressurized nip rolls squeeze the coating evenly onto the substrate so as to penetrate the surface of the substrate. The rolls may be either rubber or steel, however a set of rolls in which at least one roll being rubber is preferred. Following passage through the nip pressure rolls, the textile substrate is coursed through a drying means 50. The drying means may include a tenter frame for holding the textile substrate, and may itself encompass multiple consecutive drying means depending on the nature of the substrate to be dried. The drying temperature is preferably in the range from

225° F to 325° F. Following drying, the finished treated textile substrate is taken up on a wind up roll 52 The textile substrate may be rolled up for storage or moved to a second lamination process in preparation for ink jet printing. The textile substrate may be laminated to a carrier backing for ease of printing.

Using this application method, dry pick-up ratios of the textile substrate may vary from about 0.5% to about 50%. Typically, the dry pick-up ratios may vary from about 3 to about 20%. More typically, the dry pick-up ratios may vary from about 6 to about 15%. Wet pick-up ratios for the textile substrates are typically between 30-150%. Preferably such wet pick-up ratios are between 80-120%. Preferably for Decron banners, the wet pick up ratios are between 40-120 %.

Substrates which may be treated in accordance with the present inventive methods are varied and include paper, fabric, films, and the like, although textile fabric substrates are preferred. Such fabrics may include cotton, silk, wool, polyester, rayon, nylon, and blends thereof. Furthermore, the disclosed ink jet substrates may provide the benefits disclosed herein with or without further post-printing curing steps involving the use of heat, radiation or pressure. Ideally such treated substrates provide adhesion and/or colorfastness of the colorant with only ambient or room temperature curing or drying of the printed image. It should be noted however, that while not being necessary for the process, a post printing curing step may further enhance the colorfastness and washfastness of the printed image on the substrate. The basis weight of the various fabrics which may be treated by these formulations may be from about 2 osy to about 9 osy.

Dye classes which may be used in ink jet printers to be printed on such substrates include acid dyes, reactive dyes, direct dyes, azoic dyes, sulfur dyes, modified dyes, polymeric dyes, copolymerized dyes or other classes of colorants known to those skilled in the art. Furthermore, pigment colorants may be used in the ink jet printers to be printed on such substrates. Furthermore, it has been found that when such substrate is printed with ink jet inks containing additives, such as those described in U.S. Application bearing Serial Number 09/109,661 filed July 2, 1998 and U.S. Patent No. 5,697,694 incorporated herein by reference in its entirety, such substrate treatments may be enhanced so as to provide enhanced colorfastness and washfastness.

In a further embodiment of the present invention, such previously described treatment formulations may be used in a method to treat banner textile fabric substrates. For instance, it has been found that the pretreatment of banner textile fabric substrate with a formulation including cationic polymers, fabric softeners, and latex polymer binders

In accordance with the previously described methods enable the banner substrates to be ink jet ink printable with improved colorfastness/ color density and washfastness, with reduced color bleed. Likewise, the present invention is also directed to a treated ink jet printable banner substrate wherein the treatment comprises a formulation of cationic polymers or copolymers, fabric softeners, and an optional latex binder. A preferred embodiment of the present invention is a treated ink jet printable banner substrate wherein the treatment formulation comprises about 5-95 % cationic polymers or copolymers, about 5-20 % fabric softeners and about 0-80% latex binder.

In accordance with yet another embodiment of the present invention, there are provided articles produced by the above described methods, employing treated textile substrates as described herein. Such articles may include for example banners, wall coverings and other home furnishing products. Thus according to the present invention, ink jet printed images applied to a treated substrate as described herein resists removal of said image from said substrate, even upon repeated contact of the printed substrate with water. Such repetitive contact can be the result of normal handling of an article, accidental exposure to liquid, and routine laundering of the article. When articles according to the present invention comprise a treated substrate containing an ink jet image printed thereon, the resulting image adheres sufficiently to said substrate to resist removal therefrom upon washing of said article.

The present invention including each of the various embodiments is further described by the examples which follow. Such examples however, are not to be construed as limiting in any way either the spirit or the scope of the present invention.

Preliminary Examples

Textile substrate samples were first printed with a test pattern using a commercial ink jet printer utilizing commercial ink jet inks containing acid, reactive, and/or direct dyes. Color density, color bleed, and print quality were evaluated on the samples as printed. These textiles included cotton poplin textile substrates. Duplicates of both sets of samples were washed using a washing method as described. Color density, color bleed, print quality or appearance, and color permanence were evaluated using the washed samples. Data from the preliminary examples is expressed in Table 1 which follows.

TABLE 1

INK	INK ADDITIVE	FABRIC TREATMENT	HEAT TREATMENT	COLORFAST EVAL. WATER DELTA E	DETERG. DELTA E
Encad GA	none	none	none	< 56	<82
Encad GA	none	0.5% CP 7091 RV	none	< 29	< 66
Encad GA	none	1.0 % CP 7091 RV	none	< 28	< 50
Encad GA	none	2.0% CP 7091 RV	none	< 27	< 32

CP 7091 RV= is a diallyldimethyammonium chloride/diacetone acrylamide copolymer, ECC International. Encad GA inks employ standard monomeric dyes. Samples were hand washed.

A second more rigorous set of tests and examples were run on a variety of fabric substrates. These textile fabric substrates include the materials listed in Table 2.

Example Conditions for Second Set of Examples

Printing Steps

In each of the following examples, treated textile samples were printed using an Encad Pro E (@ 300dpi) ink jet printer obtained from Encad Inc. of San Diego, California. Encad GA, GS, or GO inks were employed using 4-Pass Enhanced Print Mode, that is with the printer passing over the textile subetrate four times. In some instances, as noted as double strike in data tables, the printing head was preheated and option identified as number "7" was selected on the printer. This option enebled more ink to be expelled from the printer onto the substrates. Dyes in the inks consisted of reactive, acid, and/or direct dyes and are described in Table 3 .

TABLE 3

Inks Used

GS Ink		
Color	Order#	Dyes
Cyan	209489	Direct
Magenta	208163-2	Acid /Reactive
Yellow	208163-3	Acid
Black	208163-4	Direct
GO Ink		
Color	Order#	
Cyan	208165-1	Pigment
Magenta	208165-2	Pigment
Yellow	208165-3	Pigment
Black	208165-4	Pigment
GA Ink		
Color	Order#	Dyes
Cyan	209491	Direct
Magenta	209490	Acid
Yellow	208164-3	Acid
Black	208164-4	Direct

Additionally, a floral three color print, using lavender, green and magenta was used for testing, of approximately 14 by 25 inches in size. Where it was difficult to distinguish between shades of green, a neutral portion (that is free of ink) of the sample was also evaluated.

Color Measurements

L* a* b* color values and optical density measurements as expressed in Table 4 were made of the printed textile substrates using an X-Rite 938 Spectrodensitometer (D65/10°) using CMY filters. The X-Rite spectrodensitometer was obtained from the X-Rite corporation of Grandville, Michigan. Average optical densities were taken as the sum of the average of three measurements using each filter. Delta E is calculated in accordance with the following equation: *

$$\Delta E = SQRT\ [(L^*standard - L^*\ sample)^2 + (a^*standard - a^*\ sample)^2 + (b^*standard - b^*\ sample)^2]$$

The higher the Delta E, the greater the change in color intensity. Unless the color's intensity is increased by a curing step, a large increase in delta E would typically be indicative of fading. These data points are listed on Table 5.

Washing Method for Textile Samples

When indicated, textile samples were washed using the following method. Samples were placed in an appropriate size beaker or container such as a one liter beaker. Samples were then placed under cold running water (between approximately 10-20° C) for approximately two minutes. The cold water was then drained from the textile samples. The beakers were then refilled with hot water (between approximately 40-50° C), and one ounce of detergent (Synthrapol ® per gallon of water was added to the beakers.

The textile samples were then washed out for approximately five minutes and then rinsed and drained of remaining water. Finally, the textile samples were rinsed with warm water (of between approximately 25-30° C) for two minutes followed by a rinse with cold water (of between approximately 10-20° C) for approximately one more minute.

Typically, although not necessarily required for curing, a second set of samples were printed and subsequently steamed using a laboratory steamer for comparison. For the purposes of the examples, if a colorfastness level is characterized as poor, bleeding or wicking has occurred. If a washfastness level has been characterized as poor, the image has washed out. If a colorfastness and washfastness level has been characterized as good, the color vibrancy and image retention is noticeably better than the poor level. If the colorfastness and washfastness levels are characterized as excellent, the color properties and vibrancy are the highest levels with the highest color density.

Examples

It should be noted that for each of the following examples, the textile substrate had been laminated to an adhesive coated paper backing which was obtained from American Builtrite, Inc. under the designation ProtecRite ® 6798 prior to printing to enable the substrate to be easily coursed through the printer. The substrates were then removed

from the backing prior to washing. Adhesive coated backing papers identified by the designation 6798 includes a paper having a nominal thickness of 5.4 mil, an initial adhesion value of 27 oz/in, a tensile strength of 16 lbs/in, and an elongation capability of 10 %. The batch formulations are listed in attached Table 6.

Example 1. Cationic copolymer CP 7091 RV (ECC International), poly(diallyldimethlammonium chloride-*co*-diacetone acrylamide), was obtained in a 49.3% stock solution in water. 20.3 parts of this solution were added to 70.3 parts water with mixing. 1.1 part Varisoft® 222 fabric softener (90% in water) was added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. A portion of this sample was laminated to an adhesive paper carrier, printed with an ink jet printer and dried under ambient conditions. The properties of the sample were evaluated for quality of the printed image, ink retention, and color density or saturation under the following conditions: 1) immediately after printing, 2) after printing and washing, 3) after printing and steaming, 4) after printing, steaming and washing. The printed samples exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement of color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. This example utilized coating 42-1 and GS ink set.

Example 2. The formulation employed in Example 1 was used to treat a 100% polyester georgette fabric. Results for this fabric were similar to those obtained in Example1. This example utilized coating 42-1 and GS ink set and GO ink set.

Example 3. 20.3 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 48.9 parts water with mixing. 22.5 parts Adogen® 432 fabric softener (4.4% in water) was added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated

with steam exhibited moderate retention of color when washed. This example utilized coating 73B and GS ink set.

Example 4. The formulation employed in Example 3 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 3. This example utilized coating 73 B and GS ink set.

Example 5. The formulation employed in Example 3 was used to treat a 100% silk crepe de chine fabric. Results for this fabric were similar to those obtained in Example 3. This example utilized coating 73 B and GS ink set.

Example 6. 20.3 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 48.9 parts water with mixing. 11.3 parts Adogen® 432 fabric softener (4.4% in water) and 11.3 part Varisoft® 222 (4.7% in water) was added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. This example utilized coating 86-4, a combination of 42-1 and 73B. with regards to fabric softener mix and GS ink set.

Example 7. A treatment composition was formulated as in Example 2, substituting 23.1 parts Accosoft® 550 fabric softener (4.3% in water) for parts Adogen® 432 fabric softener. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing of steamed was dramatically increased compared to untreated samples. Some enhancement of colorfastness was achieved without steaming. This example utilized coating 73 C and GS ink set.

Example 8. The formulation employed in Example 7 was used to treat 85/15 nylon/lycra blend fabric. Results for this fabric were similar to those obtained in Example 7. This example utilized coating 73 C and GS ink set.

Example 9. The formulation employed in Example 7 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 7. This example utilized coating 73 C and GS ink set.

Example 10. A treatment composition was formulated as in Example 3, substituting 22.7 parts Alubrasoft® Super 100 fabric softener (4.4% in water) for parts Adogen® 432 fabric softener. This formulation was used to treat (cotton poplin) via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing of steamed samples was dramatically increased compared to untreated samples. Some enhancement of colorfastness was achieved without steaming. The coating utilized in this example was 73D and GS ink set.

Example 11. The formulation employed in Example 10 was used to treat 85/15 nylon/lycra blend fabric. Results for this fabric were similar to those obtained in Example 10. The coating utilized in this example was 73 D and GS ink set.

Example 12. The formulation employed in Example 10 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 10. The coating utilized in this example was 73 D and GS ink set.

Example 13. A treatment composition was formulated as in Example 3, substituting 8.8 parts Ahcovel® fabric softener (11.3% in water) for parts Adogen® 432 fabric softener. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing of steamed

5015374 .11049

samples was dramatically increased compared to untreated samples. Good enhancement of colorfastness was achieved without steaming. The coating utilized in this example was 87-1 and GS ink set.

Example 14. Cationic polymer CP 261LV (ECC International), poly(diallyldimethlammonium), was obtained in a 43.0% stock solution in water. 23.3 parts of this solution was added to 47.1 parts water with mixing. 21.3 parts Varisoft® 222 fabric softener (4.7% in water) was added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited moderate retention of color when washed. Some enhancement of colorfastness was achieved. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. The coating utilized in this example was 86-3 and GS ink set.

Example 15. 28.8 parts of a solution containing 80% ethoxylated polyethylenimine (34.7% in water) was combined with 41.6 parts water with mixing. 21.3 parts Varisoft® 222 fabric softener (4.7% in water) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited moderate retention of color when washed. Some enhancement of colorfastness was achieved. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. The coating utilized in this example was 86-2 and GS ink set.

Example 16. 22.5 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 291.5 parts water with mixing. 40.3 parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water)(of AirProducts and Chemicals Inc. of Allentown, Pennsylvania), 51.1 parts PrintRite® 595 acrylic emulsion (BF Goodrich,

43.5% in water), and 94.6 parts Varisoft® 222 fabric softener (4.7% in water) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% Cotton Poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. The coating used in this example was 88-1 and GS ink set.

Example 17. The formulation employed in Example 16 was used to treat a 100% cotton Jersey knit fabric. Results for this fabric were similar to those obtained in Example 16. The coating used in this example was 88-1 and GS ink set.

Example 18. The formulation employed in Example 16 was used to treat an 85/15 nylon/lycra blend fabric. Results for this fabric were similar to those obtained in Example 16. The coating used in this example was 88-1 and GS ink set.

Example 19. The formulation employed in Example 16 was used to a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 16. The coating used in this example was 88-1 and GS ink set.

Example 20. The formulation employed in Example 16 was used to a 100% silk crepe de chine fabric. Results for this fabric were similar to those obtained in Example 16. The coating used in this example was 88-1 and GS ink set.

Example 21. 22.5 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 291.5 parts water with mixing. 40.3 parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water), 51.1 parts PrintRite® 591 acrylic emulsion (BF Goodrich, 43.5% in water), and 94.6 parts Varisoft® 222 fabric softener (4.7% in water) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color

when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. Little measurable washout was detected. The coating used in this example was 88-2 and GS ink set..

Example 22. The formulation employed in Example 21 was used to treat a 100% cotton Jersey Knit fabric. Results for this fabric were similar to those obtained in Example 21. The coating used in this example was 88-2 and GS ink set.

Example 23. The formulation employed in Example 21 was used to treat a 100% silk charmeuse fabric. Results for this fabric were similar to those obtained in Example 21. This substrate was cleaning using commercial dry cleaning facilities and the results are reflected in the TABLE 7. The coating used in this example was 88-2 and GS ink set.

Example 24. 55.3 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 285.9 parts water with mixing. 62.7 parts PrintRite® 591 acrylic emulsion (BF Goodrich, 43.5% in water), and 116.1 parts Varisoft® 222 fabric softener (4.7% in water) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Washfastness of steamed samples and samples not post-treated with steam exhibited moderate retention of color when washed. The coating used in this example was 88-3 and GS ink set.

Example 25. The formulation employed in Example 24 was used to treat an 85/15 nylon/lycra blend fabric. Results for this fabric were similar to those obtained in Example 24. The coating used in this example was 88-3 and GS ink set.

Example 26. 55.3 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 285.9 parts water with mixing. 62.7 parts PrintRite® 595 acrylic emulsion (BF Goodrich, 43.5% in water), and 94.6 parts Varisoft® 222 fabric softener (4.7% in water) were added and the entire solution was mixed until homogeneous. This

6015374.1104499

formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. The coating used in this example was 88-4 and GS ink set.

Example 27. The formulation employed in Example 26 was used to treat an 85/15 nylon/lycra blend fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was not improved in these samples. The coating used in this example was 88-4 and GS ink set.

Example 28. 55.3 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 279.2 parts water with mixing. 49.4 parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water), and 116.1 parts Varisoft® 222 fabric softener (4.7% in water) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% cotton poplin via a padding application and dried. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. The coating used in this example was 88-5 and GS ink set.

Example 29. The formulation employed in Example 28) was used to treat an 85/15 nylon/lycra blend fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was not improved in these samples. The coating used in this example was 88-5 and GS ink set.

Example 30. 22.5 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 392 parts water with mixing. 80.6 parts Airflex® 540 latex emulsion

231

00232

(ethylene-vinyl acetate copolymer, 55.2% in water), and 4.9 parts Varisoft® 222 fabric softener (90% in water) were added and the entire solution was mixed until homogeneous. This formulation was used to treat a 250 denier polyester/cotton banner fabric via a padding application and dried. The sample was printed as described in Example 1. The printed samples exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other steps. The coating used in this example was 88-5.

Example 31. 22.5 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 392 parts water with mixing. 80.6 parts Airflex® 540 latex emulsion (ethylene-vinyl acetate copolymer, 55.2% in water), and 6.7 parts Adogen® 432 fabric softener (68.7% in water) were added and the entire solution was mixed until homogeneous. This formulation was used to treat a 250 denier polyester/cotton banner fabric via a padding application and dried. The sample was printed as described in Example 1. The printed samples exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other steps. The coating used in this example was 75 E.

Textile samples in Examples 30 through 35 were printed with Encad GO ink set obtained from the Encad Inc.

Example 32. The formulation employed in Example 31 was used to treat a polyester poplin fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other curing steps.

Example 33. The formulation employed in Example 31 was used to treat a polyester satin fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other curing steps. In addition, sample possessed excellent color reflectivity.

0016374.11049

B2
08233

Example 34. The formulation employed in Example 31 was used to treat a polyester poplin fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other steps.

Example 35. The formulation employed in Example 31 was used to treat a polyester satin fabric. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Permanence of color to washing was dramatically increased without steaming or other steps. In addition, sample possessed excellent color reflectivity.

Example 36. 50.7 parts cationic copolymer CP 7091 RV (ECC International) (49.3% in water) was added to 993.5 parts water with mixing. 230.9 parts PrintRite® 591 acrylic emulsion (BF Goodrich, 43.3% in water), and 296.3 parts Varisoft® 475 fabric softener (6.8% in water) were added and the entire solution was mixed until homogeneous. This formulation was used to treat 100% silk charmeuse via a padding application and dried. Wet pick-up was 140%. The sample was printed and evaluated using the process described in Example 1. The printed sample exhibited superior image quality with little or no bleed, excellent ink retention, and excellent color density. Samples that were not steamed exhibited good retention of color when washed. Samples that were steamed exhibited excellent enhancement for color and appearance. Permanence of color to washing was dramatically increased compared to untreated samples. The coating used in this example was 91-4 and GS ink set.

0016374 .110499

Results of Examples 30-36

The printed images on the textile samples from examples 29-35 were waterfast and exhibited acceptable lightfastness for outdoor stability in accordance with ASTM test method G26 when printed with Encad GO inks. ASTM test method G26 included the following steps:

The standard practice under ASTM G26 for operating a light-exposure (xenon-arc type) with and without water for exposure of nonmetallic materials consists of the following procedures. Test method 1 was employed for continuous exposure to light and intermittent exposure to water spray. The type of apparatus used consisted of an Atlas CI 5000 apparatus. The instrument was programmed for continuous light and

0023

intermittent water spray in accordance with the manufacturer's instructions. The conventional cycle of 102 minutes of light exposure followed by a cycle of 18 minutes of light and water spray was employed. Such data measurements are reflected in TABLE 8.

The preferred coatings by fabric type are as follows: Cotton Poplin and Jersey Knit preferably use coating 88-2 at 13 % total solids; Silk Crepe de Chine and Charmeuse use coating 91-5 at 7 % total solids; Polyester Georgette uses coating 75D at 32 % total solids; Poly Satin and Poly Dacron use coating 75D at 32 % total solids; and Poly Poplin uses coating 75D AT 20-25 % total solids.

If textile post treatment is desired, a still further alternate embodiment of the present invention relates to treatments or coating formulations for textile substrates which enhance the color brilliance, adhesion, and/or waterfastness/detergentfastness of inkjet reactive, acid dye, and pigment based inks on textile fabric substrates, utilizing an imbibing solution in conjunction with a substrate coating. For the purposes of this application, an imbibing solution shall mean a solution used to saturate a fabric such that it penetrates the interstitial spaces of the fabric. The coating solution may include the imbibing solution or in the alternative, the coating solution and imbibing solution may be applied in a separate application step.

The treatment or coating formulations in the present invention consist primarily of cationic polymers, binders, fabric softeners, and other additives similar to those previously described. However, in conjunction with these coating formulations, an imbibing solution is used to further treat the fabric substrate. For example in a first embodiment utilizing the imbibing solution, an imbibing solution consisting of either sodium bicarbonate or sodium carbonate and urea for added color brilliance with post-treatment is used with a coated fabric treatment. The imbibing solution is desirably applied at a level of 5-20 % by weight, depending on fabric type, and by using a standard saturation/padding method. The first embodiment is to be used with the reactive colorant classes, including those which may be applied via ink jet printing processes such as the monochlorotriazines and/or vinyl sulfones with the imbibing solution.

In a second embodiment utilizing the imbibing solution, the imbibing solution consists of ammonium sulfate and urea for added color brilliance with post-treatment. The second embodiment is to be used with the acid dye class including those which may be applied via ink jet printing processes with the imbibing solution. The imbibing solution is desirably applied at a level of 5-20 % by weight, depending on fabric type, and by using a standard saturation/padding method.

5016374.1 10499

Textile substrates for use with the treatment methods may include cotton, silk, linen, polyester, rayon, nylon, and blends thereof. Conventionally, reactive dyes are used for cotton substrates and acid dyes are used for silk and nylon substrates. However, because of the coating treatment and fixation treatment (imbibing solution) associated with it, the invention allows for the fixation of classes of dyes on substrates that they are not normally associated with, or would not be done commercially because the fixation is not normally facile or efficient. As demonstrated by the second set of examples which follow, the disclosed ink jet receptive substrates that have been further treated with an imbibing solution provide high color density and saturation, superior print quality, reduction of wicking or bleeding, and enhanced ink absorption. Furthermore, the coating or treatment formulations provide a color enhanced waterfast/detergentfast printed image when printed with an ink jet printing process with post-printing steps, such as heating, steaming, chemical fixation, or radiation curing. With a conventional steaming process, minimal dye washout occurs, thus minimal dyewaste occurs.

This alternate embodiment of the present invention is further described by the second set of examples which follow. Such examples, however, are not meant to be construed as limiting in any way either the spirit or the scope of the present invention.

SECOND SET EXAMPLE CONDITIONS:

A series of coatings were created including cationic polymers, fabric softeners, latex binders, other additives and water. The coatings are identified below with the respective content percentages. It should be noted that certain coatings included an imbibing solution in their formulation while others did not and an imbibing solution was utilized in a separate application step. Batch sizes are expressed in grams.

Coating 88-2 referred to as Types A, B & D for use with cotton fabrics

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size (grams)
7091RV	49.30	18.50	37.53	18.01
AirFlex 540	55.17	37.00	67.07	32.19
PR591	43.50	37.00	85.06	40.83
VS475	10.00	7.40	74.00	35.52
Water			569.69	273.45
	12	100	833.33	400

For Coating 88-2, 7091RV functions as a cationic, the AirFlex 540 is a latex, the PR591 is a latex and the VS475 is a fabric softener.

Separate Imbibing Solution referred to as Type C for use with cotton fabrics

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
Sodium Bicarbonate	63.40	3.00	4.73	22.70
Urea	95.00	5.00	5.26	30.81
Q2-5211	100.00	0.20	0.20	1.17
Water			58.34	341.49
	12	8.2	68.33	Approx. 400

The Dyeset concentrations were obtained from Sybron Chemicals of Wellford, South Carolina and the Q2-5211 which is a wetting agent, was obtained from Dow Corning. The sodium bicarbonate can be obtained from VWR of Norcross, Georgia and Baker Chemical, and the Urea can be obtained from Baker Chemical.

The Combo, which is a combination of coating and imbibing solution, referred to as Type E, for use with cotton fabrics.

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
7091RV	49.30	16.50	33.47	16.06
AirFlex 540	55.17	35.00	63.44	30.45
PR591	43.50	35.00	80.46	38.62
VS475	10.00	5.40	54.00	25.92
Sodium Bicarb	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Water			591.97	284.15
	12	100	833.33	400

236

60237

Coating 88-2(No. 2), referred to as Type F, used for cotton fabrics

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
709IRV	49.30	17.50	35.50	17.04
AirFlex 540	55.17	36.00	65.25	31.32
PR591	43.50	36.00	82.76	39.72
VS475	10.00	7.40	74.00	35.52
Dyeset NOZ	12.20	3.00	24.59	11.80
Q2-5211	100.00	0.20	0.20	0.10
Water			551.23	264.59
	12	100	833.33	400

Coating 88-2/NFS, referred to as Type G, used for cotton

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
709IRV	49.30	17.50	35.50	17.04
AirFlex 540	55.17	36.00	65.25	31.32
PR591	43.50	36.00	82.76	39.72
VS475	10.00	7.40	74.00	35.52
Dyeset NFS	36.70	3.00	8.17	3.92
Q2-5211	100.00	0.20	0.20	0.10
Water			567.65	272.47
	12	100	833.33	400

5 Coating Type 88-2/conc, referred to as Type H for cotton fabrics.

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
709IRV	49.30	17.50	35.50	17.04
AirFlex 540	55.17	36.00	65.25	31.32
PR591	43.50	36.00	82.76	39.72
VS475	10.00	7.40	74.00	35.52
Dyeset Conc.	47.60	3.00	6.30	3.03
Q2-5211	100.00	0.20	0.20	0.10
Water			569.52	273.37
	12	100	833.33	400

6015374.1104499

237

6023

Coating 88-2/Conc. referred to as Type I for cotton fabrics

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
7091RV	49.30	15.50	31.44	15.09
AirFlex 540	55.17	34.00	61.63	29.58
PR591	43.50	34.00	78.16	37.52
VS475	10.00	5.40	54.00	25.92
Dyeset Conc	47.60	3.00	6.30	3.03
Sodium Bicarb	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Water			591.81	284.07
	12	100	833.33	400

Coating 88-2/NOZ referred to as Type J for cotton fabrics.

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
7091 RV	49.30	15.50	31.44	15.09
AirFlex 540	55.17	34.00	61.63	29.58
PR591	43.50	34.00	78.16	37.52
VS475	10.00	5.40	54.00	25.92
Dyeset NOZ	12.20	3.00	24.59	11.80
Sodium Bicarb	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Water			573.52	275.29
	12	100	833.33	400

6015374.110499

238
144

Coating 88-2/NFS referred to as Type K for cotton fabrics.

Order of Addition Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
7091RV	49.30	15.50	31.44	15.09
AirFlex 540	55.17	34.00	61.63	29.58
PR 591	43.50	34.00	78.16	37.52
VS475	10.00	5.40	54.00	25.92
Dyeset NFS	36.70	3.00	8.17	3.92
Sodium Bicarb	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Water			589.94	283.17
	12	100	833.33	400

023

It should be noted that the above coatings can be used on a variety of textiles including silk and nylon. Additionally, the following coating can be used for Nylon/Lycra and silk substrates when using acid dyes.

Coating 159-1used for Nylon/Lycra and silk fabrics with acid dyes sets

Order of Addition	Ingredients	% Total Solids	Dry Parts	Wet Parts	Batch Size
5	Retan 204LS	17.95	25.00	139.28	452.62
2	AirFlex 540	55.27	100.00	181.26	589.08
3	VS475	10.00	20.00	200.00	649.97
4	Q2-5211	100.00	2.70	2.70	8.77
		1.00	0.00	0.00	0.00
		1.00	0.00	0.00	0.00
1	water			707.80	2299.58
		12	147.7	1230.83	4000

6016374.1 10499

239

Reactive Dye Examples

Example 1

In this and the following examples 11 by 15 inch fabric samples were evaluated.

In example 1, the samples were first coated and then imbibed. In particular, the fabric was first coated through a dip and nip procedure/padding as has been previously described, using coating A and then dried in a forced air oven at 100°C. Following this step the fabric sample was imbibed in a dip and nip/padding method using imbibing solution C and dried again in the oven at 100°C. For each example (except where otherwise noted) four fabric sample sheets were tested. In order to achieve good hand attributes the goal for percent dry pickup was between 7 and 9. The percent dry pickup was calculated in accordance with the following series of equations. These equations are described in Wellington Sears Handbook of Industrial Textiles, by Sabit Adanur, PH.D.copyright 1995, p179.

$$\text{Wet pickup (\%)} = \frac{\text{Weight of formulation picked up}}{\text{Weight of dry fabric}} \times 100$$

$$\text{Add-on (\%)} = \text{Concentration of Formulation (\%)} \times \text{Wet Pickup (\%)}$$

From this the following equation was utilized to arrive at the values in the charts for % dry-pickup.

$$\text{\% Dry Pickup} = ((\text{Wet/Basis Weight}) \times 100) - 100 \times \text{\% Solids (TS)}$$

Results of Example 1

Objective: To imbibe cotton poplin fabric using Type A coating and separate imbibing solution. T.S.* of 11.6 in percent			
#	BW Dry in grms/m²	Wet weight in grams	% Pickup Dry
1	14.1	24.29	8.4
2	14.1	24.21	8.4
3	14.3	24.74	8.5
4	14.3	25.28	9.0

*T.S. represents total solids (percent), BW represents basis weight

5015374.1 .110Hg

2/10

00241

Example 2

In this example fabric samples were imbibed first using imbibing solution Type C and then coated with Coating Type B using the procedures described in Example 1.

Objective: To Imbibe Cotton Poplin using Type B with T.S. 11.6/T.S. 10.6						
Imbibing Step T.S. 11.6				Coating Step T.S. 10.6		
SAMPLE #	BW in grms/m²	Wet weight in grms	% Dry Pickup	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.85	22.71	12.6	12.42	22.20	8.4
2	10.87	22.88	12.7	12.38	21.35	7.7
3	10.8	22.16	12.2	12.34	22.22	8.5
4	10.9	22.46	12.3	11.74	20.94	8.3

Example 3

In this example fabric samples were imbibed only with solution Type C..

Objective: To Imbibe Cotton Poplin with solution Type C with T.S. of 12			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	10.83	21.92	11.8
2	10.68	21.63	12.1
3	9.69	19.75	12.1
4	9.7	20.6	12.9

Example 4

In this example fabric samples were coated only with Type D coating.

Objective: To coat fabric samples only with 88-2 coating/ T.S. 10.6, Type D			
Sample #	BW in grms/m²	Wet weight in grms	% Dry Pickup
1	9.73	18.46	9.5
2	9.84	18.54	9.3
3	10.73	20.79	9.9
4	10.76	20.93	10.1

6 1637441.1107499

241 CD242

Example 5

In this example fabric samples were coated with the combo Type E solution.

Objective: To treat fabrics with the combo solution/T.S. 11.4, Type E			
Sample #	BW in grms/m^2	Wet weight in grms	% Dry Pickup
1	10.97	21.14	10.6
2	10.74	20.47	10.3
3	10.75	20.62	10.5

Example 6

In this example fabric samples were coated with Type F coating.

Objective: Type F including coating 88-2; dyeset NOZ and T.S. 11.1			
Sample #	BW in grms/m^2	Wet weight in grms	% Dry Pickup
1	10.84	21.7	11.1
2	11.02	21.29	10.3
3	10.87	21.28	10.7

Example 7

In this example fabric samples were treated with Type G coating.

Objective: Type G including coating 88-2; dyeset NFS and T.S. 11.68			
Sample #	BW in grms/m^2	Wet weight in grms	% Dry Pickup
1	10.84	21.1	11.1
2	10.85	20.7	10.6
3	10.77	20.7	10.6

Example 8

In this example fabric samples were treated with Type H coating.

Objective: Type H including coating 88-2; dyeset conc T.S. 11.2			
Sample #	BW in grms/m^2	Wet weight in grms	% Dry Pickup
1	10.86	21.1	10.5
2	10.86	21.3	10.6
3	10.86	20.6	10.4

6016374A.110499

242 37 00243

Example 9

In this example fabric samples were treated with Type I coating.

Objective: Type I including coating 88-2; conc T.S. 11.4			
Sample #	BW in grms/m^2	Wet weight in grms	% Dry Pickup
1	10.6	20.9	11.1
2	10.9	21.4	10.9
3	10.8	21.2	10.9

Example 10

In this example fabric samples were treated with Type J coating.

Objective: Type J including coating 88-2 NOZ T.S. 11			
Sample #	BW in grms/m^2	Wet weight in grms	% Dry Pickup
1	10.98	21.4	10.5
2	10.78	21.2	10.6
3	10.72	20.73	10.2

Example 11

In this example fabric samples were treated with Type K coating.

Objective: Type K including coating 88-2 NFS			
Sample #	BW in grms/m^2	Wet weight in grms	% Dry Pickup
1	12.2	24.1	11.7
2	12.2	23.8	11.4
3	10.7	20.8	11.3

Reactive Dye Example Results

Each of the samples were exposed on half of their area to D65 (standard day light) to determine whether any yellowing occurs. A sample of each was also printed using the TX-1500 printer of Encad and a reactive ink set available from Kimberly-Clark Printing Technology, Inc. of Escondido, California under the designations 17960-17970 . Prior to printing, the fabric sample was first laminated to a backing as has been previously

6016374.1104499

213
00244

described in the first example set. Examples of reactive dyes used include reactive blue 49 and black 5 available from companies such as DyStar and BASF corporation. The reactive dye sets utilize vinyl sulfones and monochlorotriazines.

Since reactive dyes are typically not ink-jetted because of the level of particulates and other salt components in the dyes, a reactive dye set was developed for testing with the coatings. It is surmised that other reactive dye sets could also be used in conjunction with the coatings, such as those dyes available from Ciba.

The dyed samples were dried overnight in the dark.

Type A was demonstrated to work well only after it had been steamed. Exposing Type A to a water wash was acceptable before steaming but detergent wash demonstrated considerable washout.

Type B was demonstrated to work well without steaming but had some redepositing problems onto the fabric.

Type C was demonstrated as having the most washout of all samples tested without steaming and having a visually impaired appearance. After steaming the results for type C were very much improved.

Type D demonstrated positive results across all samples but failed the water spot test and printed samples. Only after washing and/or after steam and washing did Type D sample pass water spot testing.

Type E demonstrated very acceptable results with water spotting occurring on printed sample only. Type E demonstrated poor results in detergent washing with no post processing steps.

Type F demonstrated positive visual appearances as did Type H samples.

Type G samples failed most testing.

Types I, J and K each demonstrated relatively the same positive results, although type K was shown to be a better performer in terms of appearance and washability.

For the purposes of this application the water spot test comprised AATTC Test Method 104-1994. Essentially, in this test a drop of water is placed on a substrate and then rubbed down using a glass rod. The substrate is then observed to see if a water spot remains after the water dries. If a white circle appears then a water spot is considered to have been left.

Alternatively, instead of using reactive dye sets, acid dye sets may be used with acid dye fixation solutions (imbibing solutions). Textile substrates which can use the acid dye sets include ones such as those with fibers that are dyeable with acid dyes, blended

SO1537H1 .110H99

244

00245

yarns, as long as the ratio is at least 15% between nylon and other material such as Lycra, and polyamides. Such acid dye sets are available from Kimberly-Clark Printing Technology, Inc. under the designation 17972-17975.

By using such dye sets an inkjet solution to a conventional screen printing process using acid dyes and a treated substrate is provided. Providing a digital alternative to this market will greatly reduce the cost for the manufacturing of textiles and will allow for more custom-made products to be produced.

Desirably the acid dye fixation formula (imbibing solution) includes deionized water in the range of 30-90 %, but preferably at about 83 weight percentage, ammonium sulfate in the range of 2 to 40 % but preferably at about 10 weight percent, urea in the range of 1 to 40 % but preferably at about 5 weight percent and an optional surfactant in the range of 0.1-1.0, preferably, surfynol 465 at about 0.2 weight percent. The acid dye fixation formula described above (acid imbibing solution) is used with a particular coating, such as coatings 88-2 (described in the reactive dye section) and 159-1, by being poured into the coating in a 50/50 ratio and then applied to the substrate as previously described, as opposed to being applied in a separate application step. For the silk substrate in particular, the coating used was coating 159-1 combined in a 50/50 ratio with the acid imbibing solution.

6015374.1 110499

Acid Dye Examples

A coated and imbibed nylon fabric was prepared in a similar fashion to the fabric samples previously described, and printed with a test print on the dried sample. The sample was washed in hot water with no apparent dye washout.

In a second set of examples, acid dye sets were used on silk charmeuse and on Nylon/Lycra fabric samples. As in the prior examples, fabric sheet swatches of 11 by 15 inches were cut of the fabric and the fabric was tested in accordance with various test coatings. It should be noted that these fabrics can not be printed on directly while uncoated. The results for just washing demonstrates a Delta E of 40 for nylon/Lycra and a Delta E of 35 for the silk charmeuse without post treatment. However, following post treatment for coated fabrics the Delta E values for both are 1.5 or less. For the purposes of the tables the following abbreviations are significant. The abbreviation STM means steamed after printed, S & W means steamed and washed after printed, WSH means washed after printed and STD means standard printed without post treatment. The results of testing for these fabrics for reactive and acid dyes are expressed in attached

Tables. It should be understood that steaming and washing techniques are those previously described for the first example set.

It should also be recognized that Pigmented Ink Formulations may also be used in conjunction with the coating and imbibing solution formulations. It is particularly desirable to use Pigmented Ink formulations available from Kimberly-Clark Printing Technology, Inc. under the designations 17976-17979. Examples of the pigment dispersions include Acryjet Cyan, majenta, yellow and black available from the Rhom and Haas corporation.

The coating or treatment formulations, which are the subject of this invention, provide ink jet printable textile substrates which possess characteristics of print and image quality, a noticeable color enhancement, color quality and density, ink retention capacity, and waterfastness and detergentfastness properties.

While the invention has been described in detail with particular reference to a preferred embodiment thereof, it should be understood that many modifications, additions, and deletions can be made thereto without departure from the spirit and the scope of the invention as set forth in the following claims.

246 08247

CLAIMS

What is claimed is:

1. A method of treating a substrate so as to improve the adhesion, colorfastness and washfastness of an ink jet ink printed onto the substrate with a curing step, the method comprising:
   treating a substrate with a formulation of cationic polymers and fabric softeners;
   treating the substrate with an imbibing solution
   post treating the substrate.

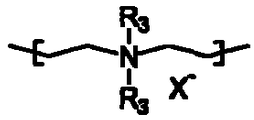
2. A method of improving the adhesion, colorfastness and washfastness of an ink jet ink printed onto a substrate, the method comprising:
   treating a substrate with a formulation of cationic polymers and fabric softeners, wherein said cationic polymers are present in said formulation in an amount of about 5 to 95 % by solids and said fabric softener is present in said formulation in an amount of about 5-20 % by solids;
   treating the substrate with an imbibing solution;
   drying said treated substrate;
   printing the substrate with an ink jet ink.

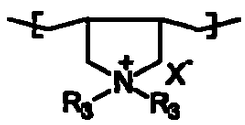
6015374.11049S

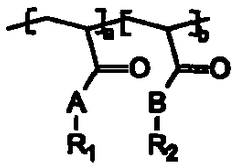
2117

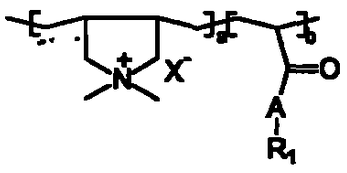
60248

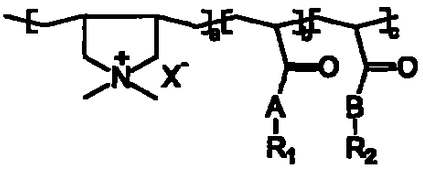
FIG. 1
GENERAL STRUCTURES











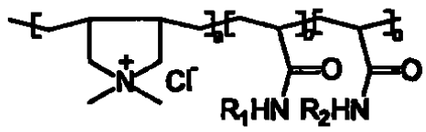
A, B= O, NH, N—

R_1, R_2= quaternary ammonium,hydrophilic, hydrophobic, reactive, or self condensing group

R_3= H, alkyl, or alkoxy group

X= halogen or other counter ion

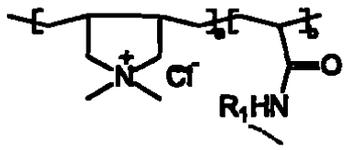
MORE SPECIFIC WITH CHLORIDE COUTERION AND ACRYLAMIDO LINKAGES



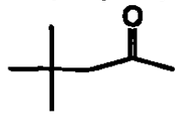
a= 1 to 99%, b= (100-a)%, c= 0 to 100-(a+b)%

R1, R2 - as above

PREFERRED



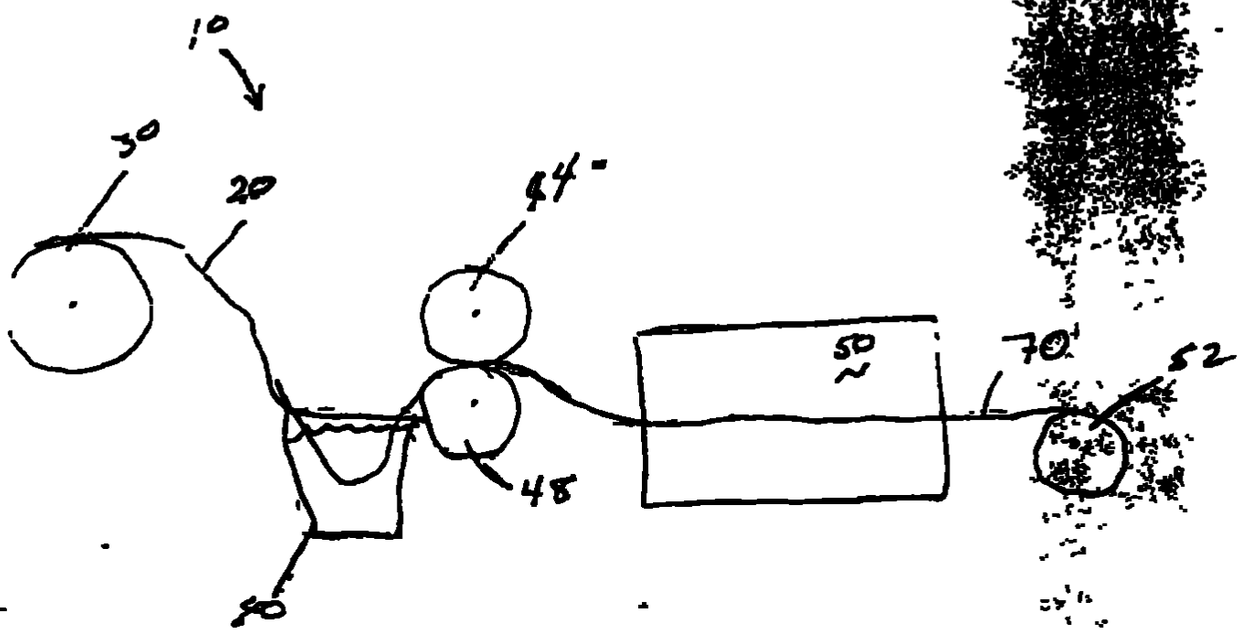
a= 1 to 99%, b= (100-a)%

R_1 = 

for CP 7091 RV, a ~ 90; b ~ 10

66h0TT' Th7E9T09

FIG. 2



250 #6 0025

In the United States Patent and Trademark Office

Applicants:	Alison S. Bagwell et al.	Docket No.:	15280
Serial No.:		Group:	
Filed:	November 4, 1999	Examiner:	

For: COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM

Express Mail

Combined Declaration and Power of Attorney
Provisional U.S. Patent Application
Joint Inventors

ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

Sir:

As the below-named inventors, we hereby declare that:

Our respective residence addresses, post office addresses and citizenship designations are as stated below, next to our names.

We believe that we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought in the patent application entitled:

COATING FOR TREATING SUBSTRATES FOR INK JET PRINTING INCLUDING IMBIBING SOLUTION FOR ENHANCED IMAGE VISUALIZATION AND RETENTION, METHOD FOR TREATING SAID SUBSTRATES, AND ARTICLES PRODUCED THEREFROM

the specification of which is attached hereto.

We hereby state that each of us has reviewed and understands the contents of the above-identified specification, including the claims and any accompanying drawings as amended by any amendment specifically referred to in the oath or declaration.

We acknowledge our duty to disclose all information which is material to the patentability of this application as defined by 37, C.F.R. 1.56.

As the named inventors, we hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the U.S. Patent and Trademark Office connected herewith:

Patricia A. Charlier, Reg. No. 38840; Thomas J. Connelly, Reg. No. 28404; Gregory E. Croft, Reg. No. 27542; Jeffrey B. Curtin, Reg. No. 37601; Jeremiah J. Duggan, Reg. No. 24470; Steven D. Flack, Reg. No. 40608; Thomas M. Gage, Reg. No. 33385; Scott B. Garrison, Reg. No. 39198; Joseph P. Harps, Reg. No. 28854; William D. Herrick, Reg. No. 25468; Kyle K. Kappes, Reg. No. 34846; John P. Kirby, Jr., Reg. No. 25348; Nancy M. Klembus, Reg. No. 40051; Nicholas N. Leach, Reg. No. 31776; Thomas J. Mielke, Reg. No. 31399; Douglas L. Miller, Reg. No. 30406; Lisa J. Moyles, Reg. No. 40737; Thomas M. Parker, Reg. No. 42052; Brian C. Pauls, Reg. No. 40122; Sebastian C. Pugliese III, Reg. No. 42091; James B. Robinson, Reg. No. 34912; Karl V. Sidor, Reg. No. 32597; Douglas H. Tulley, Reg. No.

60158794.110499

251
462
00252

34743; Patrick C. Wilson, Reg. No. 31893; and Paul Y. Yee, Reg. No. 29460.

Please send all correspondence to Steven D. Flack, Kimberly-Clark Worldwide, Inc., 401 North Lake Street, Neenah, Wisconsin 54956.

Our representative may be reached at: (770) 587-8646.

We hereby declare that:

1. All statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and
2. These statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

First Named Inventor's Full Name:	Alison Salyer Bagwell
First Named Inventor's Signature:	
Date of Execution of this Document by First Named Inventor:	Date: _____
First Named Inventor's Country of Citizenship:	United States of America
First Named Inventor's Residence Address:	4310 Wellington Place Cumming, GA 30040
First Named Inventor's Post Office Address:	Same as Residence Address
Second Named Inventor's Full Name:	Kelly Dean Branham
Second Named Inventor's Signature:	
Date of Execution of this Document by Second Named Inventor:	Date: _____
Second Named Inventor's Country of Citizenship:	United States of America
Second Named Inventor's Residence Address:	3337 Rae Place Lawrenceville, GA 30044
Second Named Inventor's Post Office Address:	Same as Residence Address
Third Named Inventor's Full Name:	Mary E. Farris
Third Named Inventor's Signature:	
Date of Execution of this Document by Third Named Inventor:	Date: _____
Third Named Inventor's Country of Citizenship:	United States of America
Third Named Inventor's Residence Address:	5475 Memphis Street Cumming, GA 30040
Third Named Inventor's Post Office Address:	Same as Residence Address

60163741.110499

252

#87

#U253

Fourth Named Inventor's Full Name:	Leonard Eugene Zelazoski
Fourth Named Inventor's Signature:	
Date of Execution of this Document by Fourth Named Inventor:	Date: _____
Fourth Named Inventor's Country of Citizenship:	United States of America
Fourth Named Inventor's Residence Address:	3785 Junction Drive Kennesaw, GA 30144
Fourth Named Inventor's Post Office Address:	Same as Residence Address

60163744.110499

253

Table 2

Digital Fabric Product Line Specifications

Fabric Type	Style	Construction	Sources	Weight (oz/yd2)
[illegible]	[illegible]	Plain Weave	[illegible]	[illegible]
[illegible]	[illegible]	Satin	[illegible]	[illegible]
[illegible]	250 Dacron	Plain Weave	[illegible]	3.2 oz/yd2
[illegible]	[illegible]	Plain Weave	[illegible]	[illegible]
[illegible]	[illegible]	Knit	[illegible]	[illegible]
[illegible]		Plain Weave	[illegible]	[illegible]
[illegible]	[illegible]	Satin	[illegible]	[illegible]
[illegible]	[illegible]	Crepe	[illegible]	[illegible]
[illegible]	[illegible]	Crepe Georgette	[illegible]	[illegible]
[illegible]		Knit	[illegible]	[illegible]
[illegible]	[illegible]	Knit	[illegible]	[illegible]
[illegible]	[illegible]	Knit	[illegible]	[illegible]
[illegible]	[illegible]	Crepe	[illegible]	[illegible]

SDI63741-110499

Color Values

Fabric Type	L*	a*	b*	C*	h*	Dk	DH	V	M	C	Y
Cotton Poplin Double Strike 5 heat settings											
Burgundy	45 06	19 14	5 05	19 80	345 22			0.80	0 05	0 63	0 77
Magenta	57 12	48 05	13.25	49 84	344 58			0 52	0 86	0 26	0 51
Orange	54 30	41 82	21 19	46 88	26 87			0 54	0 91	0 26	0 88
Red	55 00	42 15	13 07	44 40	18 34			0 53	0 89	0 26	0 79
Black 1	30.11	0 95	2 05	2 26	65 14			1 20	1 21	0 18	1 24
Yellow	89 90	10 33	71 24	71 99	98 25			0 09	0 00	0 07	0 08
Green	67 60	39 11	33 68	51 61	139 27			0 48	0 31	0 62	0 68
Cyan	63 16	-21.83	40 76	46 24	241 83			0 84	0 42	0 04	0 18
Blue	42 52	6 08	12 21	32 78	280 60			0 97	0 01	1 00	0 98
Black 2	31.81	2.20	10 99	11 21	281 32			1 17	1 16	1 16	1 00
Lavender	42.57	12 22	32 01	35 11	290 37			0 94	0 93	0 93	0 55
Cotton Poplin Double Strike 5 heat settings 2 hours											
Burgundy	46 30	10 00	4 70	10 50	346 00	0 44	0 03	0 70	0 95	0 62	0 78
Magenta	57 50	47 30	12 80	49 00	344 90	1 00	0 30	0 52	0 85	0 26	0 51
Orange	54 50	41 60	20 60	46 40	26.40	0 70	0 40	0 54	0 90	0 26	0 87
Red	55 00	41 60	14 60	44 10	19 30	0 60	0 70	0 54	0 80	0 27	0 80
Black 1	30 90	0 80	2 10	2 20	67 70	0 80	0 10	1 18	1 19	1 18	1 22
Yellow	89.80	9 90	70 90	71 60	97 90	0 70	0 40	0.09	0 10	0 08	0 08
Green	67.20	-38 70	32 90	50 80	139 70	1 00	0 40	0 47	0 31	0 61	0 68
Cyan	62 70	-22 00	39 90	45 60	241 10	1 00	0 60	0 85	0 43	0 05	0 17
Blue	42.80	5 90	-31.30	31 90	280 70	0 90	0 00	0 98	0 01	0 00	0 97
Black 2	30.80	3.30	10 50	11 00	287.40	1 60	1 20	1 21	1 21	1 10	1 01
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Burgundy	48 74	19 82	7 03	21 35	338 19			0 73	0 87	0 [illegible]	0 68
Magenta	64.41	31 50	10 83	33 31	341 03			0 59	0 80	0 78	0 55
Orange	56 65	38 20	17 03	42 25	25 11			0 51	0 83	0 [illegible]	0 80
Red	57 31	38.98	10 20	40.29	14 66			0 50	0 81	0 [illegible]	0 71
Black 1	34 17	0.93	0.45	1 03	25.82			1 07	1 08	1 07	1.09
Yellow	89.88	-10.53	03 59	64 46	99.40			0.09	0 10	0 08	0 58
Green	48.49	-12 06	9 53	15 37	141 68			0 79	0 73	0 83	0.85
Cyan	86 70	19 02	37 38	42 22	242 31			0 56	0 37	0 80	0 14
Blue	49.02	4 81	31 41	31 78	278 71			0 80	0 75	0 83	0 45
Black 2	37.60	2 21	12 64	12 83	270 02			1 03	1 01	1 03	0 80
Lavender	64.96	0 19	28 46	20 01	287 90			0 50	0 48	0 48	0 25
Polyester Georgette											
Double Strike											
3 heat settings											
2 hours											
Burgundy	48.90	19 40	-7.40	20 80	339.20	0 70	0 40	0 72	0 85	0 58	0 88
Magenta	66.20	30 45	10 40	32.20	341.20	1 40	0 11	0.59	0 79	0 39	0 56
Orange	57.00	37 10	18 20	41 30	26 10	1 10	0 70	0 51	0 82	0 26	0 80
Red	57 70	37 80	10 20	39 10	15 10	1 30	0 20	0 50	0 70	0 25	0 60
Black 1	36.02	0 80	1 60	1 80	64 30	2 20	0 90	0 89	1 00	0 98	1 02
Yellow	88 70	11 50	62 50	63 50	100 40	1 70	1 10	0 05	0 05	0 05	0 55
Green	48 52	11 70	0 70	15 20	140 20	0 50	0 40	0 78	0 72	0 82	0 81
Cyan	87.33	19.40	-30 10	41 00	241 70	1 40	0 40	0 40	0 [illegible]	0 72	0 09
Blue	49.80	4.23	-29 50	29 80	278.20	2 20	-0.30	0 74	0 68	0 77	0 41
Black 2	38.40	2 20	11 90	12 10	280 00	1 10	0 10	0.95	0 93	0 94	0 78
Lavender	49.40	9 90	-29 60	31 10	288 50	2 20	0 20	0 74	0 72	0 73	0 42

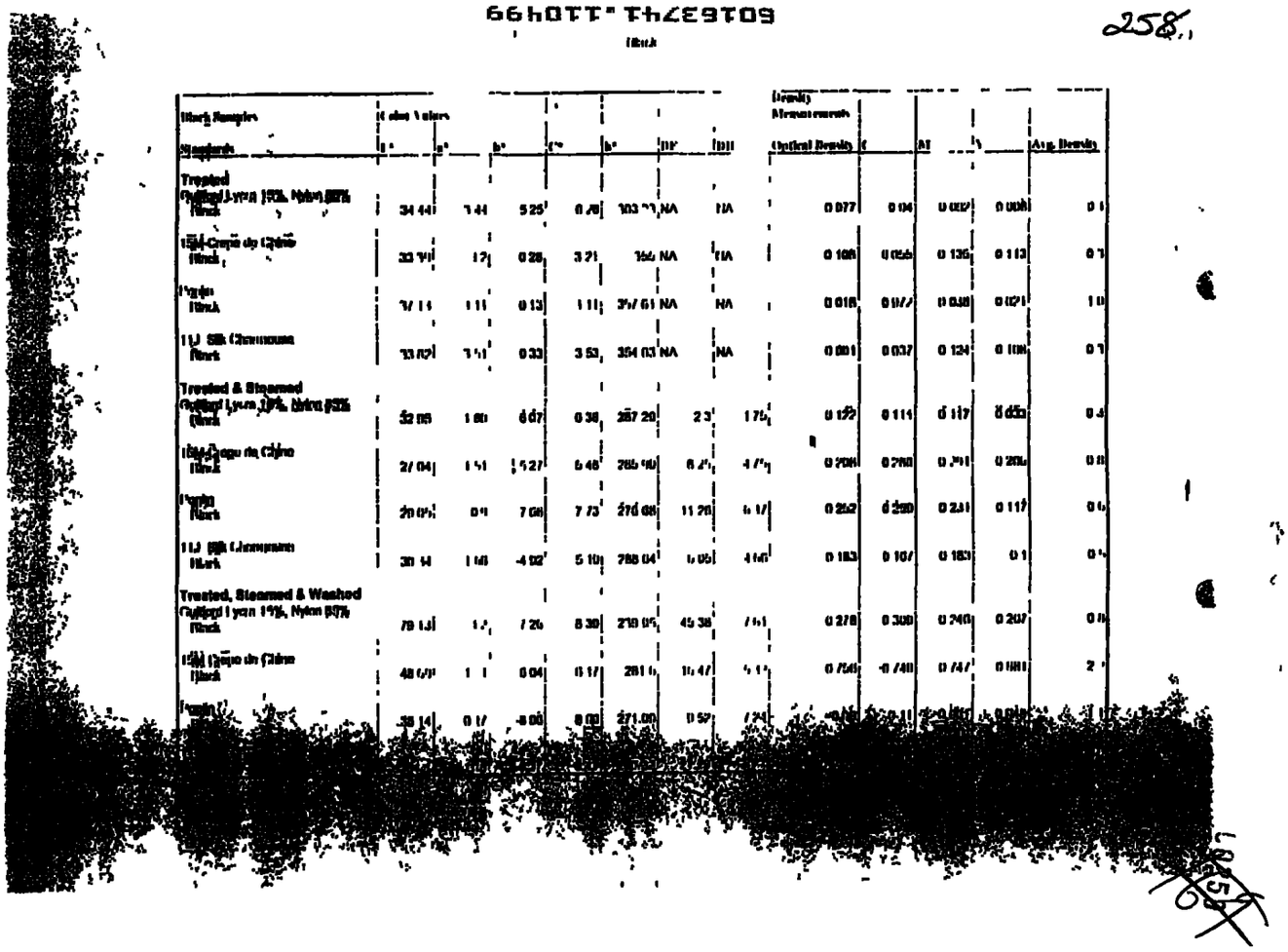
08256

Avg Densi
2.35
1.82
2.05
1.95
2.63
0.83
1.81
1.53
2.47
3.32
2.41
2.35
1.82
2.03
1.96
3.57
0.84
1.62
1.55
2.47
3.44
2.42

257

2.11	
1 74	
1 89	
1 77	
3.23	
0 78	
2.41	
1.31	
2 03	
2.90	
1 21	
2.10	
1 73	
1 87	
1 73	
3 01	
0 65	
2 37	
1 12	
1.88	
2.85	
1 87	

Abuse

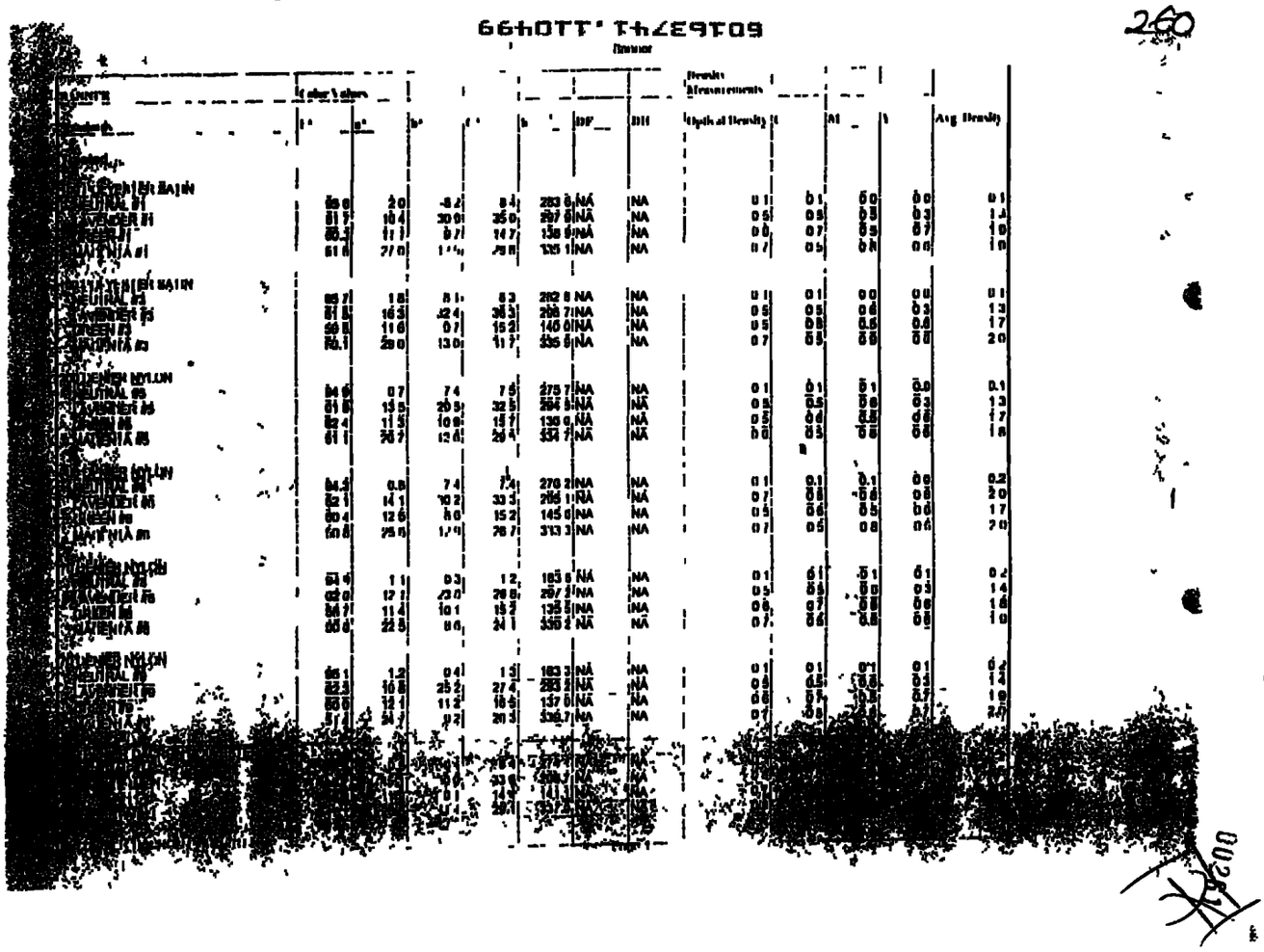


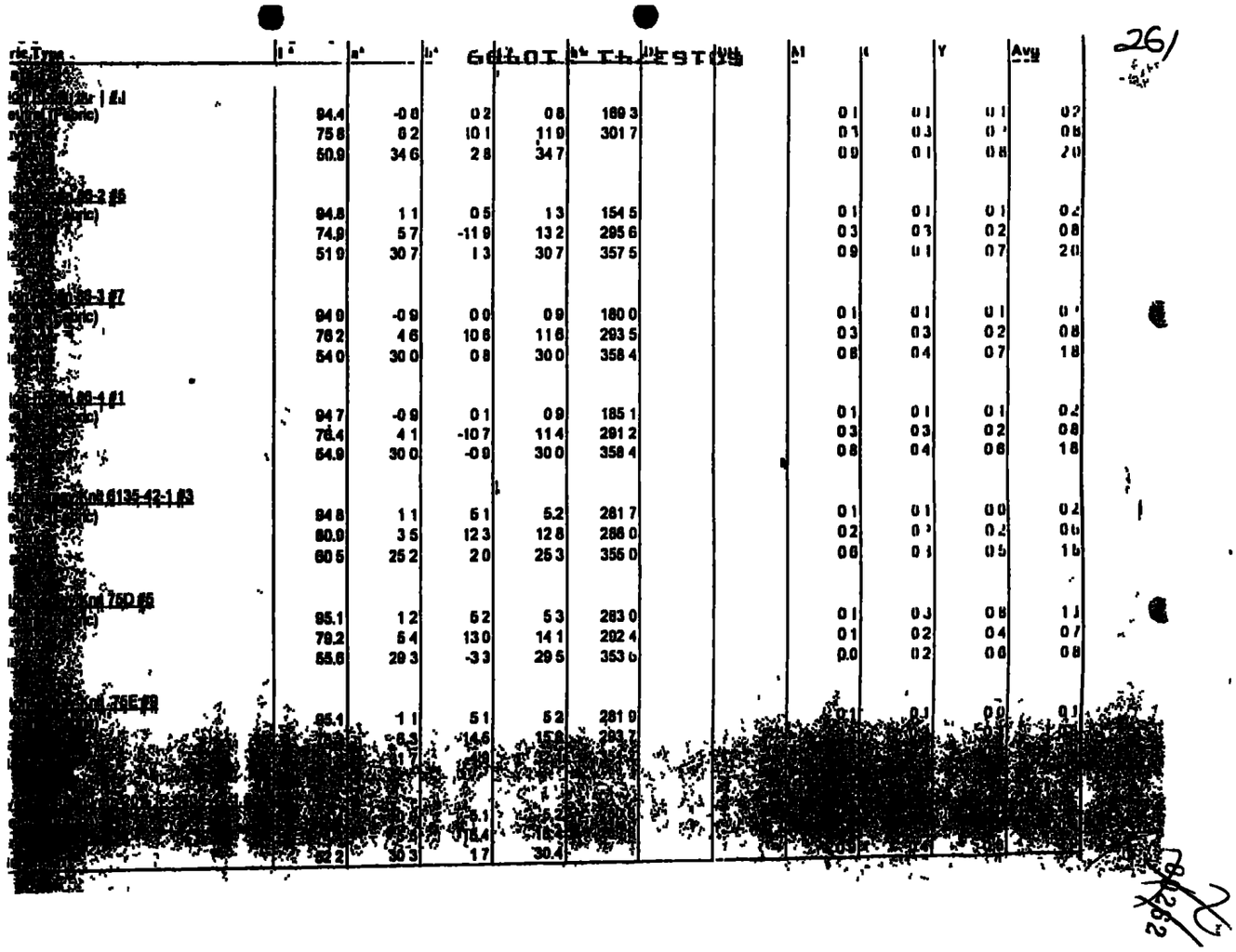
Black Samples / Standards	Color Values L*	a*	b*	c*	h°	DE*	DH	Density Measurements Optical Density				Avg. Density
Treated												
Ring Spun Cotton 100% Black	34.44	1.44	5.25	5.45	105.11	NA	NA	0.077	0.104	0.082	0.088	0.1
Open-End Spun Cotton Black	33.91	1.2	0.28	3.21	166	NA	NA	0.108	0.055	0.136	0.113	0.1
Nylon Black	37.15	1.11	0.13	1.11	357.61	NA	NA	0.018	0.017	0.038	0.021	1.0
100% Silk Charmeuse Black	33.82	1.41	0.33	3.53	354.03	NA	NA	0.081	0.037	0.124	0.108	0.1
Treated & Steamed												
Ring Spun Cotton 100% Black	32.05	1.80	6.07	6.38	287.29	2.3	1.75	0.122	0.111	0.117	0.053	0.4
Open-End Spun Cotton Black	27.04	1.51	5.27	5.48	285.49	6.2	4.71	0.208	0.260	0.291	0.206	0.8
Nylon Black	29.05	0.9	7.08	7.73	270.68	11.26	6.17	0.252	0.290	0.231	0.117	0.6
100% Silk Charmeuse Black	30.14	1.48	-4.92	5.19	288.04	6.05	4.66	0.183	0.167	0.183	0.1	0.1
Treated, Steamed & Washed												
Ring Spun Cotton 100% Black	29.13	1.2	7.26	8.39	279.95	45.38	7.61	0.278	0.308	0.248	0.207	0.8
Open-End Spun Cotton Black	48.67	1.1	0.04	0.17	281.1	19.47	5.11	0.754	0.748	0.747	0.181	2.1
Nylon Black	38.14	0.17	-8.00	8.00	271.09	0.52	7.24	0.11	0.11	0.11	0.11	0.1

1256

259 OUT PD

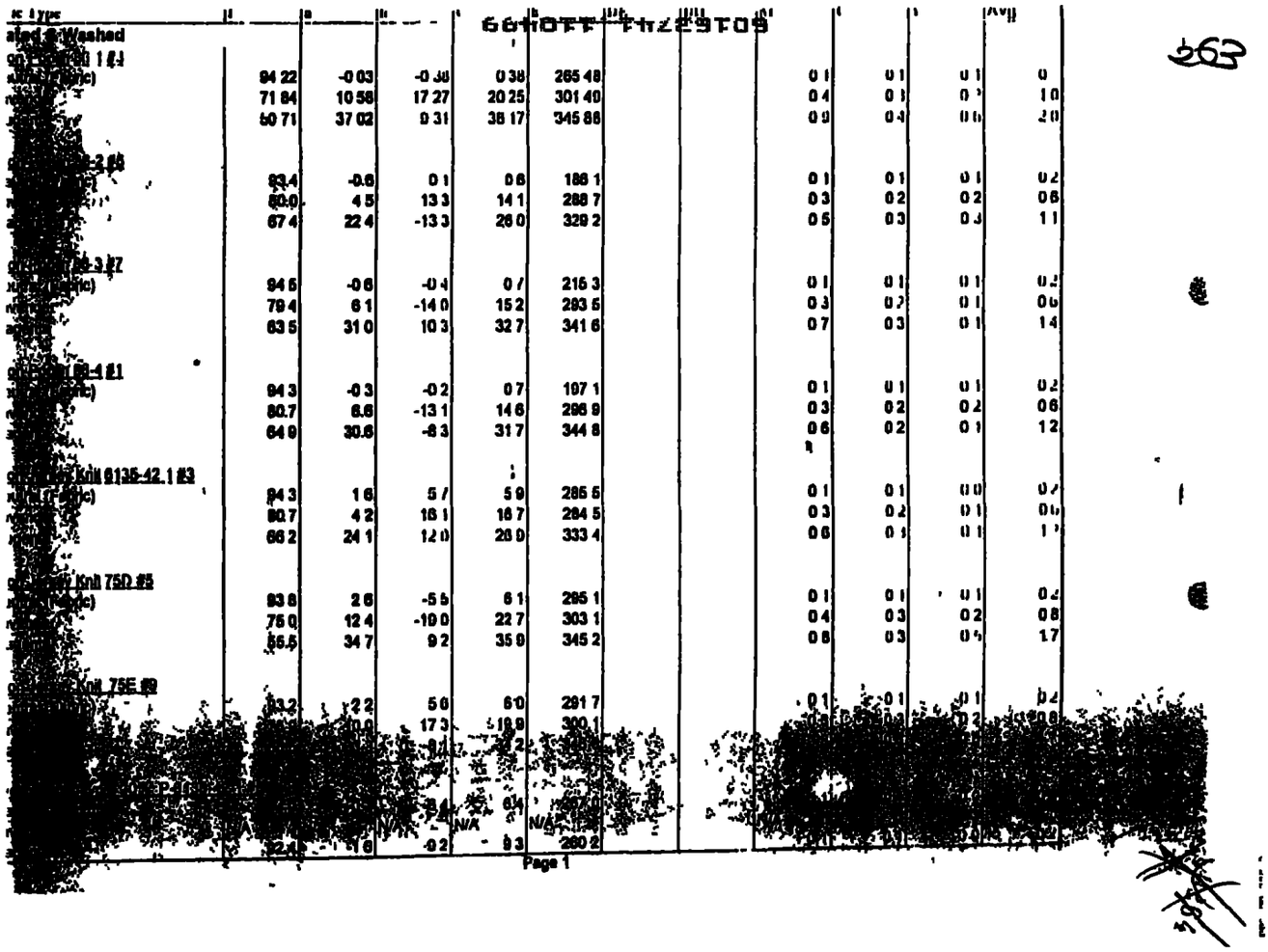
	Color Values					Delta Measurements						
Standards	L*	a*	b*	C*	h°	DE	DE	Optical Density C				
Treated & Washed												
Under Room 75D												
Neutral Fabric	61.5	-0.1	-1.8	1.8	266.3	2.1	-1.4					
Lavender	58.7	-1.5	-5.1	5.3	254.0	4.4	-4.5					
Green	62.0	-4.5	-2.1	4.9	204.6	24.8	-22.6					
Masonic	72.5	2.1	-1.3	2.5	319.0	9.4	-8.1					
Under Room 75C												
Neutral Fabric	64.4	-1.3	-1.5	1.9	229.4	-1.5	-1.3					
Lavender	59.5	-3.4	-4.3	5.4	231.8	-6.2	-4.8					
Green	60.7	-4.1	-2.1	4.6	243.0	30.7	34.5					
Masonic	68.2	-1.1	-3.1	3.3	251.3	4.2	-3.9					
Treated & Steamed												
Under Room 75E												
Neutral Fabric	64.6	-1.6	-3.1	3.5	243.5	-4.6	-3.6					
Lavender	58.3	-5.1	-25.1	25.7	258.2	-31.7	33.8					
Green	60.7	-13.1	34.1	36.5	290.2	-41.1	47.8					
Masonic	64.1	35.1	-31.8	47.3	323.3	19.8	-13.3					
Under Room 75C												
Neutral Fabric	64.1	-1.1	-3.8	3.9	254.1	-3.8	-3.6					
Lavender	58.1	-4.1	-24.1	24.4	259.7	-31.1	33.1					
Green	60.1	-12.1	34.1	36.1	289.7	-41.1	47.8					
Masonic	64.1	35.1	-31.8	47.3	323.3	19.8	-13.3					
Under Room 75E												
Neutral Fabric	64.1	-1.1	-3.8	3.9	254.1	-3.8	-3.6					
Lavender	58.1	-4.1	-24.1	24.4	259.7	-31.1	33.1					
Green	60.1	-12.1	34.1	36.1	289.7	-41.1	47.8					
Masonic	64.1	35.1	-31.8	47.3	323.3	19.8	-13.3					
Under Room 75D												
Neutral Fabric	64.1	-1.1	-3.8	3.9	274.1	2.1	-1.4					
Lavender	58.2	-4.1	-25.1	25.7	260.9	31.8	33.8					
Green	60.1	-12.1	34.1	36.1	292.5	31.1	-31.1					
Masonic	64.1	35.1	-31.8	47.3	322.3	19.8	-13.3					
Treated, Steamed & Washed												
Under Room 75E												
Neutral Fabric	63.1	-1.1	-3.1	3.3	247.1	-3.1	-2.5					
Lavender	58.1	-4.1	-24.1	24.4	259.1	-31.1	33.1					
Green	60.1	-12.1	34.1	36.1	289.1	-41.1	47.8					
Masonic	64.1	35.1	-31.8	47.3	323.3	19.8	-13.3					
Under Room 75C												
Neutral Fabric	63.1	-1.1	-3.1	3.3	247.1	-3.1	-2.5					
Lavender	57.1	-4.1	-24.1	24.4	259.1	-31.1	33.1					
Green	71.1	-12.1	34.1	36.1	289.1	-41.1	47.8					
Masonic	64.1	35.1	-31.8	47.3	323.3	19.8	-13.3					
Under Room 75E												
Neutral Fabric	63.1	-1.1	-3.1	3.3	247.1	-3.1	-2.5					
Lavender	57.1	-4.1	-24.1	24.4	259.1	-31.1	33.1					
Green	71.1	-12.1	34.1	36.1	289.1	-41.1	47.8					
Masonic	64.1	35.1	-31.8	47.3	323.3	19.8	-13.3					
Under Room 75D												
Neutral Fabric	63.1	-1.1	-3.1	3.3	247.1	-3.1	-2.5					
Lavender	57.1	-4.1	-24.1	24.4	259.1	-31.1	33.1					
Green	71.1	-12.1	34.1	36.1	289.1	-41.1	47.8					
Masonic	64.1	35.1	-31.8	47.3	323.3	19.8	-13.3					



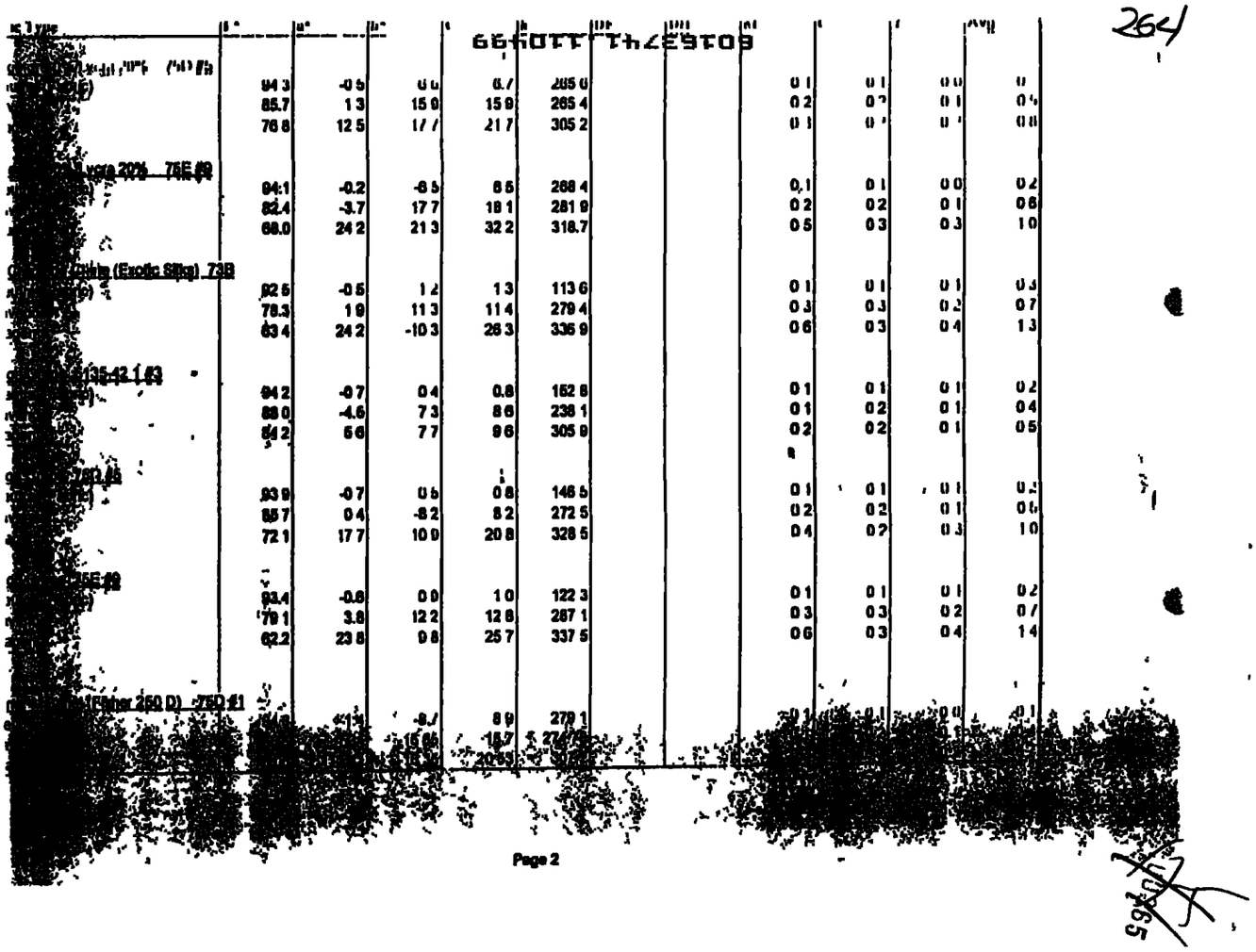


	94.4	-0.8	0.2	0.8	189.3		0.1	0.1	0.1	0.2
	75.8	6.2	10.1	11.9	301.7		0.1	0.3	0.1	0.6
	50.9	34.6	2.8	34.7			0.9	0.1	0.8	2.0
	94.8	1.1	0.5	1.3	154.5		0.1	0.1	0.1	0.2
	74.9	5.7	-11.9	13.2	295.6		0.3	0.3	0.2	0.8
	51.9	30.7	1.3	30.7	357.5		0.9	0.1	0.7	2.0
	94.9	-0.9	0.0	0.9	180.0		0.1	0.1	0.1	0.1
	76.2	4.6	10.6	11.6	293.5		0.3	0.3	0.2	0.8
	54.0	30.0	0.8	30.0	358.4		0.8	0.4	0.7	1.8
	94.7	-0.9	0.1	0.9	185.1		0.1	0.1	0.1	0.2
	76.4	4.1	-10.7	11.4	291.2		0.3	0.3	0.2	0.8
	54.9	30.0	-0.9	30.0	358.4		0.8	0.4	0.6	1.8
	94.8	1.1	5.1	5.2	281.7		0.1	0.1	0.0	0.2
	80.9	3.5	12.3	12.8	288.0		0.2	0.1	0.2	0.6
	60.5	25.2	2.0	25.3	355.0		0.6	0.1	0.5	1.5
	95.1	1.2	5.2	5.3	283.0		0.1	0.3	0.8	1.1
	79.2	5.4	13.0	14.1	292.4		0.1	0.2	0.4	0.7
	55.8	29.3	-3.3	29.5	353.6		0.0	0.2	0.6	0.8
	95.1	1.1	5.1	5.2	281.9		0.1	0.1	0.0	0.1
		-6.3	14.6	15.9	293.7					
			5.1							
			15.4							
	82.2	30.3	1.7	30.4						

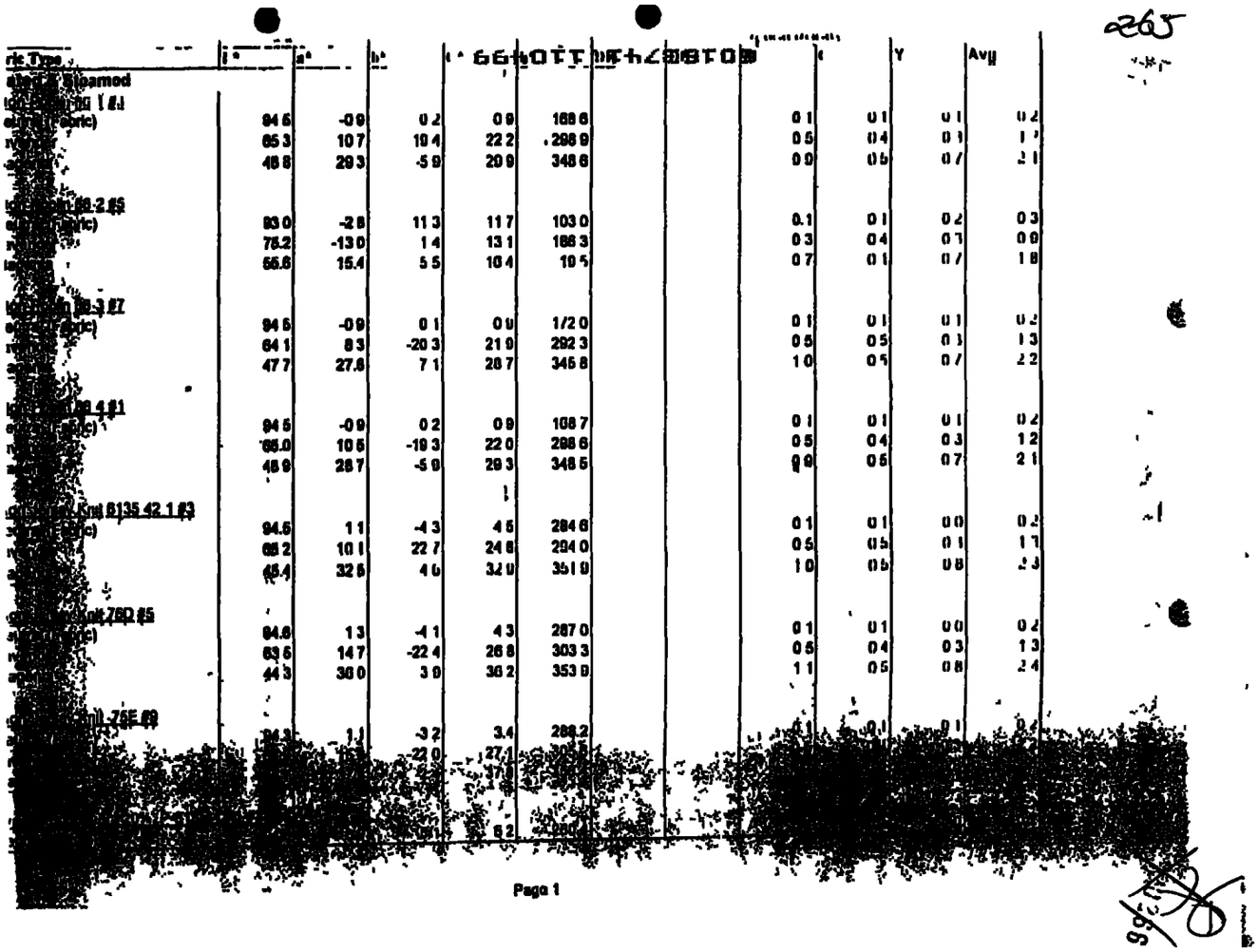
le Type												
	94 8	-0 7	5 5	5.6	262.7			0 1	0 1	0 0	0.2	
	73 9	6 2	18 4	19 4	288 7			0 3	0 3	0 2	0 9	
	52.6	29 0	6 9	29 8	346 7			0 8	0 1	0 6	1 6	
	94.8	-0 7	-5 5	5 6	263 0			0 1	0 1	0 0	0.2	
	72.6	6 7	-19.6	20.7	288 9			0 4	0 3	0 2	0 9	
	48 7	32 8	7 1	33 6	347 7			0 9	0 4	0 7	2 1	
	93 8	1 3	1 0	2 1	128 0			0 1	0 1	0 1	0 1	
	67.5	5 3	16 2	17 0	288 0			0 1	0 4	0 3	1 2	
	44 2	33 4	1 4	33 4	357 6			1 1	0 5	0 9	2 1	
	94.1	-1.2	1 1	1 7	137 7			0 1	0 1	0 1	0 2	
	74.8	3 0	-11 4	11 7	284 3			0 3	0 3	0 2	0 9	
	54 1	28 0	2 1	27 0	4 4			0 8	0 4	0 7	1 9	
	94.2	1 2	1 4	1 8	128 6			0 1	0 1	0 1	0 2	
	75 0	4 8	10 5	11 6	294 4			0 3	0 3	0 2	0 9	
	53 2	27 7	-0 3	27 7	359 4			0 8	0 4	0 7	1 9	
	94 0	-1 2	1 5	1 9	129 4			0 1	0 1	0 1	0 2	
	75 0	3 4	-9 6	10 2	289 4			0 3	0 3	0 2	0 9	
	53 8	26 8	0 2	26 8				0 8	0 4	0 7	1 9	
	93 4	1 1	0 9	0 0	276 8			0 1	0 1	0 0	0 2	



	94 22	-0 03	-0 38	0 38	265 48		0 1	0 1	0 1	0
	71 84	10 58	17 27	20 25	301 40		0 4	0 1	0 1	1 0
	50 71	37 02	9 31	38 17	345 88		0 9	0 4	0 0	2 0
	83 4	-0 8	0 1	0 8	186 1		0 1	0 1	0 1	0 2
	60 0	4 5	13 3	14 1	288 7		0 3	0 2	0 2	0 6
	67 4	22 4	-13 3	26 0	329 2		0 5	0 3	0 3	1 1
	94 5	-0 6	-0 4	0 7	216 3		0 1	0 1	0 1	0 2
	79 4	6 1	-14 0	15 2	283 5		0 3	0 2	0 1	0 6
	63 5	31 0	10 3	32 7	341 6		0 7	0 3	0 1	1 4
	94 3	-0 3	-0 2	0 7	197 1		0 1	0 1	0 1	0 2
	80 7	6 6	-13 1	14 6	286 9		0 3	0 2	0 2	0 6
	64 9	30 6	-8 3	31 7	344 8		0 6	0 2	0 1	1 2
	94 3	1 6	5 7	5 9	285 5		0 1	0 1	0 0	0 2
	80 7	4 2	18 1	18 7	284 5		0 3	0 2	0 1	0 6
	66 2	24 1	12 0	26 9	333 4		0 6	0 1	0 1	1 1
	83 8	2 6	-5 5	6 1	295 1		0 1	0 1	0 1	0 2
	75 0	12 4	-10 0	22 7	303 1		0 4	0 3	0 2	0 8
	65 5	34 7	9 2	35 9	345 2		0 8	0 3	0 5	1 7
	93 2	2 2	5 6	6 0	291 7		0 1	0 1	0 1	0 2
			17 3							
			N/A	N/A	N/A					
	92 4	1 6	-0 2	9 3	260 2					

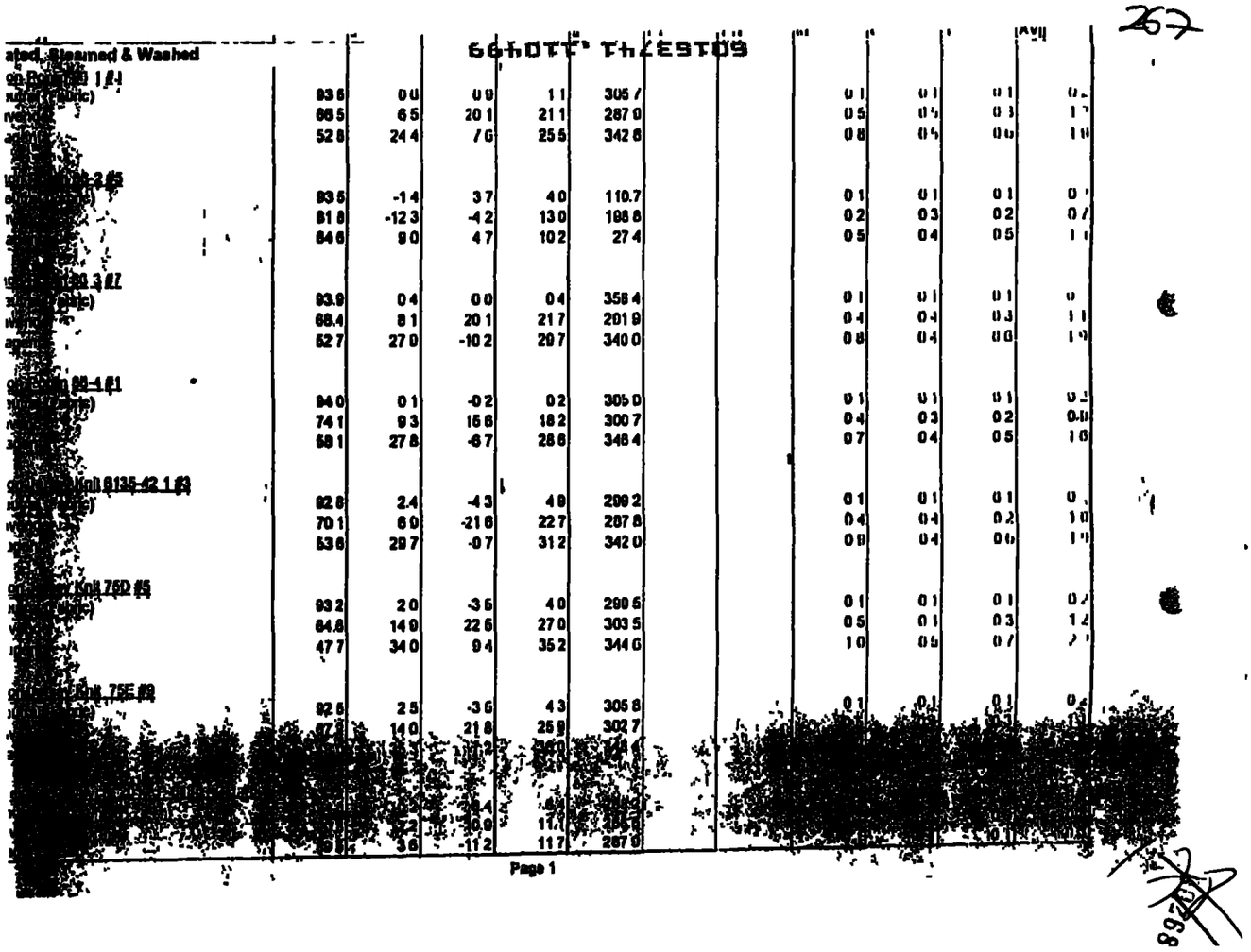


	94.3	-0.5	0.6	0.7	285.0		0.1	0.1	0.0	0
	85.7	1.3	15.9	15.9	265.4		0.2	0.2	0.1	0.4	
	76.8	12.5	17.7	21.7	305.2		0.1	0.1	0.1	0.8	
	94.1	-0.2	-6.5	6.5	268.4		0.1	0.1	0.0	0.2	
	82.4	-3.7	17.7	18.1	281.9		0.2	0.2	0.1	0.6	
	68.0	24.2	21.3	32.2	316.7		0.5	0.3	0.3	1.0	
	92.5	-0.5	1.2	1.3	113.6		0.1	0.1	0.1	0.3	
	78.3	1.9	11.3	11.4	279.4		0.3	0.3	0.2	0.7	
	63.4	24.2	-10.3	26.3	336.9		0.6	0.3	0.4	1.3	
	94.2	-0.7	0.4	0.8	152.8		0.1	0.1	0.1	0.2	
	88.0	-4.6	7.3	8.6	238.1		0.1	0.2	0.1	0.4	
	84.2	6.6	7.7	9.6	305.9		0.2	0.2	0.1	0.5	
	93.9	-0.7	0.5	0.8	146.5		0.1	0.1	0.1	0.3	
	85.7	0.4	-8.2	8.2	272.5		0.2	0.2	0.1	0.5	
	72.1	17.7	10.9	20.8	328.5		0.4	0.2	0.3	1.0	
	93.4	-0.8	0.9	1.0	122.3		0.1	0.1	0.1	0.2	
	79.1	3.8	12.2	12.8	287.1		0.3	0.3	0.2	0.7	
	62.2	23.8	9.8	25.7	337.5		0.6	0.3	0.4	1.4	



ric Type		a*	b*				Y	Avg	
	94 6	-0 9	0 2	0 9	188 6		0 1	0 1	0 2
	85 3	10 7	19 4	22 2	298 9		0 5	0 4	0 3
	48 8	29 3	-5 9	20 9	348 6		0 9	0 5	0 7
	83 0	-2 8	11 3	11 7	103 0		0 1	0 1	0 2
	78 2	-13 0	1 4	13 1	188 3		0 3	0 4	0 1
	66 6	15 4	5 5	16 4	19 5		0 7	0 1	0 7
	94 5	-0 9	0 1	0 9	172 0		0 1	0 1	0 1
	64 1	8 3	-20 3	21 9	292 3		0 5	0 5	0 3
	47 7	27 8	7 1	28 7	345 8		1 0	0 5	0 7
	94 5	-0 9	0 2	0 9	188 7		0 1	0 1	0 1
	85 0	10 5	-19 3	22 0	288 6		0 5	0 4	0 3
	48 9	28 7	-5 9	29 3	348 5		0 9	0 5	0 7
	94 5	1 1	-4 3	4 5	284 8		0 1	0 1	0 0
	68 2	10 1	22 7	24 8	294 0		0 5	0 5	0 1
	45 4	32 5	4 0	32 9	351 9		1 0	0 5	0 8
	94 6	1 3	-4 1	4 3	287 0		0 1	0 1	0 0
	63 5	14 7	-22 4	26 8	303 3		0 5	0 4	0 3
	44 3	30 0	3 9	30 2	353 9		1 1	0 5	0 8
	94 3	1 1	-3 2	3 4	288 2		0 1	0 1	0 1

ric Type	L*	a*	b*						Y	Avg	
	63.1	5.2	[illegible]	2[illegible]6	282.7			0[illegible]	0[illegible]	0 1	1 1
	48.2	22.5	0 [illegible]	2[illegible]1	344.7			0 0	0 [illegible]	0 7	1
[illegible] Lycra 20% 75D /5											
[illegible]ric)	94.7	-0.7	5.0	5.8	263.2			0 1	0 1	0 0	0 [illegible]
	63.8	11.7	-24.8	27.4	295.3			0 5	0 6	0 3	1 3
	48.9	28.8	-9.6	30.4	341.6			0 9	0 5	0 7	2 0
[illegible] Lycra 20% 75E /68											
[illegible]ric)	94.8	-0.8	-4.8	4.8	260.3			0 1	0 1	0 0	0 [illegible]
	64.3	10.0	26.0	28.4	290.6			0 5	0 5	0 3	1 [illegible]
	47.5	27.0	12.0	29.5	336.1			0 9	0 5	0 7	2 1
[illegible]ric Crepe (Exotic Silks) 738											
[illegible]ric)	93.3	-1.7	3.3	3.8	117.0			0 1	0 1	0 1	0 3
	59.0	11.4	20.9	23.9	298.6			0 6	0 5	0 1	1 5
	42.7	30.7	-3.2	30.9	354.0			1 1	0 6	0 0	2 [illegible]
[illegible] 136-12 1 83											
[illegible]ric)	93.6	1.3	2.6	2.9	116.0			0 1	0 1	0 1	0 2
	63.4	4.3	-19.8	20.3	282.3			0 6	0 6	0 3	1 3
	48.4	21.2	5.5	21.9	345.4			0 9	0 6	0 7	2 1
[illegible] 75D /5											
[illegible]ric)	93.6	1.2	2.8	3.0	114.2			0 1	0 1	0 1	0 2
	61.1	8.1	22.7	24.1	289.7			0 6	0 5	0 1	1 4
	44.8	28.3	7.2	29.1	345.8			1 0	0 5	0 8	2 1
[illegible] 75E /68											
[illegible]ric)	93.1	-1.2	3.3	3.5	110.0			0 1	0 1	0 1	0 3
	66.2	6.5	-18.6	19.7	282.6			0 5	0 4	0 3	1 2
	48.2	24.2	6.0	24.9	346.0			0 9	0 5	0 7	2 1



Page 1

Type										Avg
	94.3	-0.2	0.6	6.6	268.4		0.1	0.1	0.0	0
	87.6	0.0	14.5	14.5	270.0		0.1	0.1	0.1	0.1
	80.3	13.1	10.1	20.7	309.0		0.1	0.3	0.2	0.7
	84.2	0.0	6.5	6.5	270.2		0.1	0.1	0.0	0.
	61.4	2.7	-20.5	20.7	277.4		0.2	0.3	0.1	0.6
	64.9	24.0	-21.4	32.1	318.2		0.6	0.4	0.3	1.3
	92.2	-0.1	2.6	2.6	92.3		0.1	0.1	1.0	1.2
	68.9	11.6	17.5	21.0	303.7		0.4	0.3	0.3	1.1
	57.1	31.3	8.7	32.5	344.5		0.8	0.3	0.5	1.6
	93.7	-0.3	0.8	0.8	107.4		0.1	0.1	0.1	0.2
	80.9	5.6	8.1	9.8	304.8		0.3	0.2	0.2	0.6
	69.7	21.0	1.3	21.1	3.6		0.5	0.2	0.4	1.1
	93.3	-0.3	1.0	1.0	105.9		0.1	0.1	0.1	0.
	79.8	7.9	9.1	12.1	310.8		0.3	0.3	0.2	0.7
	66.4	25.1	0.3	25.1	0.7		0.5	0.	0.4	1.
	93.1	-0.1	0.9	0.9	98.4		0.1	0.1	0.1	0.2
	82.9	1.4	8.3	8.5	279.8		0.2	0.2	0.1	0.5
	71.2	18.1	0.6	18.1	358.0		0.4	0.2	0.4	1.0

Test S.

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH
Treated							
Cotton Poplin 66-1 #3							
Neutral (Fabric)	94.4	-0.8	3.2	3.8	99.3		
Lavender	75.5	8.2	-10.1	11.9	321.7		
Magenta	50.9	34.6	2.8	34.7			
Treated & Steamed							
Cotton Poplin 66-1 #3							
Neutral (Fabric)	94.5	-0.9	-0.2	0.9	188.6	0.4	
Lavender	85.3	10.7	-19.4	22.2	298.9	14.7	
Magenta	48.6	29.3	-5.9	29.9	348.8	10.4	
Treated							
Cotton Poplin 66-2 #5							
Neutral (Fabric)	94.8	-1.1	3.6	3.8	154.5		
Lavender	74.9	8.7	-11.9	13.2	295.8		
Magenta	51.9	30.7	-1.3	30.7	357.5		
Treated & Steamed							
Cotton Poplin 66-2 #5							
Neutral (Fabric)	93.0	-2.6	11.3	11.7	103.0	11.0	
Lavender	75.2	-13.0	-1.4	13.1	186.3	21.4	
Magenta	55.6	15.4	5.5	16.4	19.5	17.1	
Treated							
Cotton Poplin 66-3 #7							
Neutral (Fabric)	94.9	-0.9	3.0	3.9	180.0		
Lavender	78.2	4.6	-10.6	11.6	293.5		
Magenta	54.0	30.0	-0.8	30.0	358.4		
Treated & Steamed							
Cotton Poplin 66-3 #7							
Neutral (Fabric)	94.6	-0.9	0.1	0.9	172.0	0.4	
Lavender	84.1	8.3	-20.3	21.9	292.3	15.9	
Magenta	47.7	27.6	-7.1	28.7	345.6	9.2	
Treated							
Cotton Poplin 66-4 #1							
Neutral (Fabric)	94.7	-0.9	-0.1	0.9	185.1		
Lavender	76.4	4.1	-10.7	11.4	291.2		
Magenta	54.9	30.0	-0.9	30.0	358.4		
Treated & Steamed							
Cotton Poplin 66-4 #1							
Neutral (Fabric)	94.5	-0.9	0.2	0.9	192.7	0.3	
Lavender	82.0	-10.6	-19.3	22.0	298.9	15.6	
Magenta	48.8	28.6	-6.6	29.3	346.8	10.1	

270

00321

T vs T S.

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DI
Treated							
Cotton Jersey Knit 6135-42-1 #3							
Neutral (Fabric)	94.8	1.1	-5.1	5.2	281.7		
Lavender	80.8	3.8	-12.3	12.8	285.3		
Magenta	53.8	25.2	-2.0	25.3	355.0		
Treated & Steamed							
Cotton Jersey Knit 6135-42-1 #3							
Neutral (Fabric)	94.8	1.1	-4.3	4.5	284.6	0.9	
Lavender	66.2	13.1	-22.7	24.5	294.0	20.0	
Magenta	45.4	32.5	-4.6	32.9	351.9	17.0	
Treated							
Cotton Jersey Knit 75D #5							
Neutral (Fabric)	95.1	1.2	-5.2	5.3	283.0		
Lavender	78.2	5.4	-13.0	14.1	292.4		
Magenta	55.8	28.3	-3.3	29.8	353.6		
Treated & Steamed							
Cotton Jersey Knit 75D #5							
Neutral (Fabric)	94.6	1.3	-4.1	4.3	287.0	1.2	
Lavender	63.5	14.7	-22.4	26.8	303.3	20.6	
Magenta	44.3	38.0	-3.9	38.2	353.9	13.2	
Treated							
Cotton Jersey Knit 75E #9							
Neutral (Fabric)	95.1	1.1	-5.1	5.2	281.9		
Lavender	78.3	6.3	-14.6	15.8	293.7		
Magenta	53.4	31.7	-4.9	32.1	351.2		
Treated & Steamed							
Cotton Jersey Knit 75E #9							
Neutral (Fabric)	94.3	1.1	-3.2	3.4	288.2	2.0	
Lavender	64.3	15.8	-22.0	27.1	305.6	17.0	
Magenta	43.7	37.8	-2.4	37.8	356.4	11.7	
Treated							
Polyester 80%/Lycra 20% P-6135-42-1 #3							
Neutral (Fabric)	94.4	-0.9	-5.1	5.2	260.6		
Lavender	74.4	5.5	-15.4	16.4	289.8		
Magenta	52.2	30.3	1.7	30.4			
Treated & Steamed							
Polyester 80%/Lycra 20% P-6135-42-1 #3							
Neutral (Fabric)	94.3	-0.9	-5.1	5.2	260.4	0.1	
Lavender	63.4	5.7	-22.0	22.6	282.7	17.1	
Magenta	42.2	29.3	-3.3	29.5	353.7	10.8	

60151-1107459

291

T.S.

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH
Treated							
Polyester 80%/Lycra 20% TED #5							
Neutral (Fabric)	94.8	-0.7	-5.5	5.5	262.7		
Lavender	73.5	6.2	-18.4	19.4	288.7		
Magenta	52.5	33.0	-6.9	33.8	348.7		
Treated & Steamed							
Polyester 80%/Lycra 20% TED #5							
Neutral (Fabric)	94.7	-0.7	-5.6	5.6	263.2	0.1	
Lavender	53.8	11.7	-24.8*	27.4	295.3	13.2	
Magenta	48.9	28.8	-9.8	30.4	341.6	4.6	
Treated							
Polyester 80%/Lycra 20% TED #9							
Neutral (Fabric)	94.8	-0.7	-5.5	5.5	263.0		
Lavender	72.5	5.7	-19.6	20.7	288.9		
Magenta	48.7	32.5	-7.1	33.6	347.7		
Treated & Steamed							
Polyester 80%/Lycra 20% TED #9							
Neutral (Fabric)	94.6	-0.8	-4.6	4.6	260.3	0.8	
Lavender	64.3	10.0	-26.6	28.4	290.6	11.2	
Magenta	47.5	27.0	-12.0	29.5	336.1	7.6	
Treated							
Silk Crepe de China (Exotic Silks) TSB							
Neutral (Fabric)	93.8	-1.3	1.6	2.1	128.6		
Lavender	57.5	5.3	-16.2	17.0	288.0		
Magenta	44.2	33.4	-1.4	33.4	357.6		
Treated & Steamed							
Silk Crepe de China (Exotic Silks) TSB							
Neutral (Fabric)	93.3	-1.7	3.3	3.8	117.0	1.8	
Lavender	59.0	11.4	-20.9	23.9	298.6	11.6	
Magenta	42.7	30.7	-3.2	30.9	354.0	3.6	
Treated							
Rayon Crepe 6135-67-1 #3							
Neutral (Fabric)	94.1	-1.2	1.1	1.7	137.7		
Lavender	74.8	3.0	-11.4	11.7	284.3		
Magenta	54.1	26.9	2.1	27.0	4.4		
Treated & Steamed							
Rayon Crepe 6135-67-1 #3							
Neutral (Fabric)	93.8	-1.3	2.6	2.9	116.0	1.6	
Lavender	70.3	4.3	-13.8	14.5	287.2	9.0	
Magenta	48.1	21.2	1.1	21.2	3.0	6.0	

272

00273

T vs T.S.

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH
Treated							
Rayon Crepe 75D #6							
Neutral (Fabric)	94.2	-1.2	0.4	1.8	338.5		
Lavender	75.0	4.8	-10.5	11.5	294.4		
Magenta	53.2	27.7	-0.3	27.7	359.4		
Treated & Steamed							
Rayon Crepe 75D #6							
Neutral (Fabric)	93.6	-1.2	2.8	3.0	114.2	2.8	
Lavender	61.1	9.1	-22.7	24.1	289.7	18.7	
Magenta	44.8	28.3	-7.2	29.1	346.8	10.9	
Treated							
Rayon Crepe 75E #9							
Neutral (Fabric)	94.0	-1.2	1.5	1.9	129.4		
Lavender	75.0	3.4	-9.6	10.2	289.4		
Magenta	53.8	28.8	0.2	28.8			
Treated & Steamed							
Rayon Crepe 75E #9							
Neutral (Fabric)	93.1	-1.2	3.3	3.5	110.0	2.0	
Lavender	65.2	8.5	-18.6	19.7	282.6	13.7	
Magenta	48.2	24.2	-6.0	24.9	348.0	8.7	
Treated							
Banner Material (Fisher 250 D) 75D #1							
Neutral (Fabric)	93.4	1.1	-6.9	9.0	278.8		
Lavender	71.21	9.48	-20.16	21.87	292.81		
Magenta	50.38	25.69	-6.17	26.62	346.2		
Treated & Steamed							
Banner Material (Fisher 250 D) 75D #1							
Neutral (Fabric)						93.8	
Lavender						74.5	
Magenta						57.0	

vs. T.W.

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH
Treated							
Cotton Poplin 86-1 #3							
Neutral (Fabric)	94.4	-0.8	0.2	0.8	159.3		
Lavender	75.8	6.2	-10.4	12.1	301.7		
Magenta	50.9	34.6	2.8	34.7			
Treated & Washed							
Cotton Poplin 86-1 #3							
Neutral (Fabric)	94.22	-0.03	-0.38	0.38	265.49	0.9	
Lavender	71.84	10.58	-17.27	20.25	301.49	9.3	
Magenta	50.71	37.02	-9.31	38.17	346.88	12.3	
Treated							
Cotton Poplin 86-2 #5							
Neutral (Fabric)	94.8	-1.1	0.5	1.3	154.5		
Lavender	74.9	5.7	-11.9	13.2	295.6		
Magenta	51.8	30.7	-1.3	30.7	357.5		
Treated & Washed							
Cotton Poplin 86-2 #5							
Neutral (Fabric)	93.4	-0.6	-0.1	0.6	188.1	1.6	
Lavender	80.0	4.5	-13.3	14.1	288.7	5.4	
Magenta	67.4	22.4	-13.3	26.0	329.2	21.3	
Treated							
Cotton Poplin 86-3 #7							
Neutral (Fabric)	94.9	-0.9	0.0	0.9	180.0		
Lavender	78.2	4.8	-10.8	11.8	293.6		
Magenta	54.0	30.0	-0.8	30.0	358.4		
Treated & Washed							
Cotton Poplin 86-3 #7							
Neutral (Fabric)	94.5	-0.8	-0.4	0.7	216.3	0.8	
Lavender	79.4	6.1	-14.9	15.2	293.5	4.8	
Magenta	63.5	31.0	-10.3	32.7	341.6	13.5	
Treated							
Cotton Poplin 86-4 #1							
Neutral (Fabric)	94.7	-0.9	-0.1	0.9	185.1		
Lavender	76.4	4.1	-10.7	11.4	291.2		
Magenta	54.9	30.0	-0.9	30.0	358.4		
Treated & Washed							
Cotton Poplin 86-4 #1							
Neutral (Fabric)	94.3	-0.3	-0.2	0.7	197.1	0.8	
Lavender	80.7	6.6	-13.1	14.6	296.9	5.5	
Magenta	64.9	30.6	-9.3	31.7	343.5	12.5	

294

0275

va. T ·/.

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH
Treated							
Cotton Jersey Knit 6135-42-1 #3							
Neutral (Fabric)	94.8	1.1	-5.1	5.2	281.7		
Lavender	80.5	3.5	-12.3	12.8	286.0		
Magenta	60.5	25.2	-2.0	25.3	355.0		
Treated & Washed							
Cotton Jersey Knit 6135-42-1 #3							
Neutral (Fabric)	94.3	1.8	-5.7	5.9	288.5	2.9	
Lavender	80.7	4.2	-16.1	16.7	284.5	3.9	
Magenta	56.2	24.1	-12.0	26.9	333.4	11.6	
Treated							
Cotton Jersey Knit 75D #5							
Neutral (Fabric)	95.1	1.2	-5.2	5.3	283.0		
Lavender	79.2	5.4	-13.0	14.1	292.4		
Magenta	55.8	29.3	-3.3	29.5	353.9		
Treated & Washed							
Cotton Jersey Knit 75D #5							
Neutral (Fabric)	93.9	2.6	-5.5	6.1	295.1	1.9	
Lavender	75.0	12.4	-19.0	22.7	303.1	10.1	
Magenta	55.5	34.7	-9.2	35.9	345.2	8.0	
Treated							
Cotton Jersey Knit 75E #9							
Neutral (Fabric)	95.1	1.1	-5.1	5.2	281.9		
Lavender	78.3	6.3	-14.6	15.8	293.7		
Magenta	53.4	31.7	-4.9	32.1	351.2		
Treated & Washed							
Cotton Jersey Knit 75E #9							
Neutral (Fabric)	93.2	2.2	-5.6	6.0	291.7	2.3	
Lavender	75.9	10.0	-17.3	19.9	300.1	4.6	
Magenta	55.5	33.3	-8.1	34.2	346.3	4.1	
Treated							
Polyester 80%/Lycra 20% P-6135-42-1 #3							
Neutral (Fabric)	94.4	-0.9	-5.1	5.2	260.6		
Lavender	74.4	5.5	-16.4	16.4	289.8		
Magenta	52.2	30.3	1.7	30.4			
Treated & Washed							
Polyester 80%/Lycra 20% P-6135-42-1 #3							
Neutral (Fabric)	94.9	-0.3	-6.4	6.4	267.0	1.5	
Lavender	N/A	N/A	N/A	N/A	N/A	N/A	
Magenta	92.4	-1.6	-6.2	9.3	260.2	52.4	

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH
Treated							
Polyester 80%/Lycra 20% 75D #5							
Neutral (Fabric)	94.8	-0.7	-5.5	5.6	262.7		
Lavender	73.9	5.2	-18.4	19.4	286.7		
Magenta	52.5	28.0	-3.9	28.8	348.7		
Treated & Washed							
Polyester 80%/Lycra 20% 75D #5							
Neutral (Fabric)	94.3	-0.5	-8.6	8.7	266.6	3.2	
Lavender	85.7	-1.3	-15.9	15.9	265.4	14.2	
Magenta	76.8	12.5	-17.7	21.7	306.2	31.3	
Treated							
Polyester 80%/Lycra 20% 75E #9							
Neutral (Fabric)	94.8	-0.7	-5.5	5.6	263.0		
Lavender	72.5	5.7	-19.6	20.7	286.9		
Magenta	48.7	32.9	-7.1	33.6	347.7		
Treated & Washed							
Polyester 80%/Lycra 20% 75E #9							
Neutral (Fabric)	94.1	-0.2	-6.5	6.5	268.4	1.3	
Lavender	82.4	-3.7	-17.7	18.1	281.9	14.5	
Magenta	68.0	24.2	-21.3	32.2	318.7	25.4	
Treated							
Silk Crepe de Chine (Exotic Silks) 73B							
Neutral (Fabric)	93.8	-1.3	1.6	2.1	128.6		
Lavender	57.5	6.3	-16.2	17.0	288.0		
Magenta	44.2	33.4	-1.4	33.4	357.6		
Treated & Washed							
Silk Crepe de Chine (Exotic Silks) 73B							
Neutral (Fabric)	92.6	-0.5	1.2	1.3	113.6	1.6	
Lavender	78.3	1.9	-11.3	11.4	279.4	12.4	
Magenta	63.4	24.2	-10.3	26.3	336.9	23.1	
Treated							
Rayon Crepe 6135-42-1 #3							
Neutral (Fabric)	94.1	-1.2	1.1	1.7	137.7		
Lavender	74.8	3.0	-11.4	11.7	284.3		
Magenta	54.1	26.9	2.1	27.0	4.4		
Treated & Washed							
Rayon Crepe 6135-42-1 #3							
Neutral (Fabric)	94.2	-0.7	0.4	0.8	152.8	0.9	
Lavender	88.0	-4.5	-7.3	8.6	238.1	15.7	
Magenta	64.2	5.6	-2.7	6.2	335.9	38.2	

00272

vs. TAN

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH
Treated							
Rayon Crepe 75D #5							
Neutral (Fabric)	94.2	1.2	1.4	1.9	128.6		
Lavender	75.0	4.8	-10.5	11.6	294.4		
Magenta	53.2	27.7	-0.3	27.7	359.4		
Treated & Washed							
Rayon Crepe 75D #5							
Neutral (Fabric)	93.9	-0.7	0.5	0.8	146.5	2.1	
Lavender	66.7	0.4	-8.2	8.2	272.5	11.8	
Magenta	72.1	17.7	-10.9	20.8	328.5	23.6	
Treated							
Rayon Crepe 75E #9							
Neutral (Fabric)	94.0	-1.2	1.5	1.9	129.4		
Lavender	75.0	3.4	-9.6	10.2	289.4		
Magenta	53.8	26.8	0.2	26.8			
Treated & Washed							
Rayon Crepe 75E #9							
Neutral (Fabric)	93.4	-0.6	0.9	1.0	122.3	1.0	
Lavender	79.1	3.8	-12.2	12.8	287.1	4.9	
Magenta	62.2	23.8	-8.8	25.7	337.5	13.5	
Treated							
Barrier Material (Fisher 250 D) 75D #1							
Neutral (Fabric)	93.4	1.1	-8.9	9.0	276.8		
Lavender	71.21	8.48	-20.16	21.87	292.81		
Magenta	50.38	25.89	-8.17	26.62	348.2		
Treated & Washed							
Barrier Material (Fisher 250 D) 75D #1							
Neutral (Fabric)	94.8	1.4	-8.7	8.9	279.1	1.4	
Lavender	86.8	1.31	-16.66	15.7	274.78	16.7	
Magenta	76.05	12.41	-16.35	20.63	307.2	30.7	

6/6/01 10:49:37 AM

277

0278

T.S. vs. T.S.W

ric Type	Color Values L*	a*	b*	C*	h°	DE
ated & Steamed						
n Poplin 66-1 #3						
ural: Fabric)	94.5	-0.9	-0.2	0.9	188.6	
ender	65.3	10.7	-19.4	22.2	298.9	
genta	48.8	28.3	-5.8	29.9	348.6	
ated, Steamed & Washed						
n Poplin 66-1 #3						
ural: Fabric)	93.5	3.6	-0.6	3.1	305.7	
ender	66.5	9.5	-20.1	21.1	287.9	
genta	52.8	24.4	-7.8	25.6	342.8	
ated & Steamed						
n Poplin 66-2 #5						
ural: Fabric)	93.0	-2.8	0.3	2.7	173.0	
ender	75.2	-13.0	2.4	13.1	169.3	
genta	58.5	15.4	5.5	16.4	19.5	
ated, Steamed & Washed						
n Poplin 66-2 #5						
ural (Fabric)	93.5	-1.4	3.7	4.0	110.7	
ender	91.8	-12.3	4.2	13.0	198.8	
genta	64.6	9.0	4.7	10.2	27.4	
ated & Steamed						
n Poplin 66-3 #7						
ural: Fabric)	94.5	-0.9	0.2	0.9	172.0	
ender	64.1	9.3	-20.3	21.9	292.3	
genta	47.7	27.8	-7.1	28.7	345.6	
ated, Steamed & Washed						
n Poplin 66-3 #7						
ural (Fabric)	93.9	0.4	0.0	0.4	356.4	
ender	66.4	8.1	-20.1	21.7	291.9	
genta	52.7	27.9	-10.2	29.7	340.0	
ated & Steamed						
n Poplin 66-4 #1						
ural (Fabric)	94.5	-0.9	0.2	0.9	168.7	
ender	65.0	10.5	-19.3	22.0	298.6	
genta	48.9	28.7	-5.9	29.3	348.5	
ated, Steamed & Washed						
n Poplin 66-4 #1						
ural (Fabric)	94.0	0.1	-0.2	0.2	305.0	
ender	74.4	8.2	-15.6	17.6	297.9	
genta	58.6	24.2	-8.2	25.6	341.1	

278

T S. vs. T S.'/.

	Color Values					
ric Type	L*	a*	b*	C*	h°	DE
ated & Steamed						
n Jersey Knit P-6135-42-1 #3						
tural Fabric	34.5	1.1	-4.3	4.5	284.8	
ancer	55.2	10.1	-22.7	24.8	294.0	
genta	45.4	32.5	-4.2	32.8	351.9	
ated, Steamed & Washed						
n Jersey Knit P-6135-42-1 #3						
tural Fabric	32.9	2.4	-4.3	4.9	299.2	
ancer	50.1	6.8	-21.5	22.7	287.8	
genta	53.6	29.7	-9.7	31.2	342.0	
ated & Steamed						
n Jersey Knit TSD #5						
tural Fabric	34.6	1.3	-4.1	4.3	287.0	
ancer	53.5	14.7	-22.4	26.8	303.3	
genta	44.3	36.0	-9.8	36.2	353.9	
ated, Steamed & Washed						
n Jersey Knit TSD #5						
tural (Fabric)	33.2	2.0	-3.5	4.0	299.5	
ancer	54.6	14.9	-22.5	27.0	303.5	
genta	47.7	34.0	-9.4	35.2	344.6	
ated & Steamed						
n Jersey Knit TSE #9						
tural (Fabric)	34.3	1.1	-3.2	3.4	288.2	
ancer	54.3	15.8	-22.3	27.1	305.6	
genta	43.7	37.8	-9.4	37.8	359.4	
ated, Steamed & Washed						
n Jersey Knit TSE #9						
tural (Fabric)	32.5	2.5	-3.5	4.3	305.8	
ancer	57.2	14.0	-21.8	25.9	302.7	
genta	48.0	36.3	-9.2	36.0	348.4	
ted & Steamed						
ster 80%/Lycra 20% P-6135-42-1 #3						
tural (Fabric)	34.3	-0.9	-5.1	5.2	280.4	
ancer	63.1	5.2	-23.0	23.6	282.7	
genta	48.2	22.5	-8.2	23.3	344.7	
ted, Steamed & Washed						
ster 80%/Lycra 20% P-6135-42-1 #3						
tural (Fabric)	34.8	-0.2	-5.4	5.4	268.2	
ancer	60.8	4.2	-10.8	11.1	290.6	
genta	50.6	21.8	-8.8	23.7	338.4	

TS. vs. TS W

	Color Values					
ric Type	L*	a*	b*	C*	h°	D
eated & Steamed						
...ester 80%/Lycra 20% ...ED #5						
eutral Fabric	94.7	-0.7	-5.5	5.5	262.9	
ivencer	83.8	11.7	-24.8	27.4	295.3	
agenta	48.6	28.8	-6.8	30.4	346.6	
eated, Steamed & Washed						
...ester 80%/Lycra 20% ...ED #5						
eutral Fabric	94.3	-0.2	-6.8	6.8	268.4	
ivencer	87.5	0.0	-14.6	14.5	270.0	
agenta	60.3	13.1	-16.1	20.7	309.0	
ated & Steamed						
...ester 80%/Lycra 20% ...EE #9						
eutral Fabric	94.6	-0.8	-4.3	4.8	260.3	
ivencer	84.3	10.0	-28.8	29.4	290.6	
agenta	47.5	27.9	-12.3	28.5	335.1	
ated, Steamed & Washed						
...ester 80%/Lycra 20% ...EE #9						
eutral (Fabric	94.2	0.0	-6.5	6.5	270.2	30.5
ivencer	81.4	2.7	-20.5	20.7	277.4	19.6
agenta	54.9	24.0	-21.4	32.1	318.2	20.1
ated & Steamed						
...Crepe de Chine - Exotic Silks) 73B						
eutral Fabric	93.3	-1.7	3.3	3.8	117.5	
ivencer	59.0	11.4	-23.9	23.9	298.6	
agenta	42.7	30.7	-3.2	30.9	354.0	
ated, Steamed & Washed						
...Crepe de Chine - Exotic Silks) 73B						
eutral (Fabric	92.2	-0.1	2.6	2.6	92.3	
ivencer	68.9	11.6	-17.5	21.0	303.7	
agenta	57.1	31.3	-8.7	32.5	344.6	
ated & Steamed						
...on Crepe 6135-42-1 #3						
eutral (Fabric	93.6	-1.3	2.6	2.9	116.0	
ivencer	63.4	4.3	-19.8	20.3	282.3	
agenta	48.4	21.2	-5.5	21.9	345.4	
ated, Steamed & Washed						
...on Crepe 6135-42-1 #3						
eutral (Fabric	93.7	-0.3	0.8	0.8	107.4	
ivencer	80.9	5.6	-8.1	9.8	304.9	
agenta	66.7	21.6	-1.3	21.7	356.6	

280

T.S. vs. T.S.V

	Color Values					
[illegible]	L*	a*	b*	C*	h°	DE
[illegible] & Steamed						
[illegible]						
[illegible]	93.6	[illegible]	[illegible]	3.0	[illegible]	
[illegible]	91.1	[illegible]	[illegible]	24.1	289.7	
[illegible]	44.8	[illegible]	[illegible]	29.1	345.8	
[illegible], Steamed & Washed						
[illegible]						
[illegible]	93.3	-3.3	1.0	1.0	105.6	
[illegible]	79.8	[illegible]	-9.1	12.1	310.8	
[illegible]	56.4	25.1	0.3	25.1	6.7	
[illegible] & Steamed						
[illegible]						
[illegible]	93.1	[illegible]	3.3	3.5	[illegible]	
[illegible]	85.2	5.5	[illegible]	19.7	292.6	
[illegible]	48.2	24.2	-6.0	24.9	346.0	
[illegible], Steamed & Washed						
[illegible]						
[illegible] (Fabric)	93.1	-3.1	0.9	0.9	66.4	2.6
[illegible]	82.9	1.4	-8.3	8.5	279.8	21.1
[illegible]	71.2	18.1	-0.6	18.1	358.0	24.3
[illegible] & Steamed						
[illegible]						
[illegible]						
[illegible]						
[illegible]						
[illegible], Steamed & Washed						
[illegible]						
[illegible] (Fabric)						
[illegible]						
[illegible]						

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH	Optical Density M	C	Y	Avg
Treated & Washed											
Illusion Cotton 88-1											
Neutral (Fabric)	93.3	0 6	-0 9	1 0	297 8			0 1	0 1	0 1	0 2
Lavender	73 4	6 7	20 0	21 7	288 0			0 4	0 4	0 2	0 9
Magenta	56 5	37 1	22 1	43 2	329 2			0 8	0 3	0 4	1 5
											0 0
Illusion Cotton 88-2											0 0
Neutral (Fabric)	93 2	0 6	1 1	1 2	300 3			0 1	0 1	0 1	0 2
Lavender	73.1	6 9	21 0	22 1	288 3			0 4	0 3	0 2	0 9
Magenta	59 0	37 2	22 9	43 7	328 4			0 7	0 3	0 4	1 4
											0 0
Illusion Cotton 88-3											0 0
Neutral (Fabric)	93 0	0 3	-0 4	0 5	310 9			0 1	0 1	0 1	0 2
Lavender	74 5	5 6	-19 8	20 6	285 9			0 3	0 3	0 2	0 9
Magenta	61 6	34 5	-21 3	40 6	328 4			0 7	0 3	0 4	1 3
											0 0
Illusion Cotton 88-4											0 0
Neutral (Fabric)	93 6	0 5	1 2	1 3	293 1			0 1	0 1	0 1	0 2
Lavender	74 6	6 7	20 1	21 2	288 5			0 3	0 3	0 2	0 8
Magenta	61 0	36 7	22 [illegible]	42 8	328 4			0 7	0 1	0 4	1 4
											0 0
Illusion Cotton 88-5											0 0
Neutral (Fabric)	93 2	0 7	1 2	1 4	298 0			0 1	0 1	0 1	0 2
Lavender	74 1	9.1	-19 4	21.5	295 2			0 4	0 3	0 2	0 9
Magenta	58 8	39 8	21 6	45.3	331 6			0 8	0 3	0 4	1 5
Illusion Cotton 88-6											
Neutral (Fabric)	92.7	1 0	-1 3	1 6	306 4			0 1	0 1	0 1	0 3
Lavender	[illegible]	[illegible]	20 9	22.6	292 1			[illegible]	[illegible]	[illegible]	[illegible]
Magenta	[illegible]	[illegible]	21 4	44.0	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
			21 6	23.1							
Magenta	60.5	37 1	21 8	43 1	329.5						

282

Textile Swatch Summary

Sample Type	Color Values L*	a*	b*	C*	h*	ΔE*	DH	Optical Density X	Y	Avg
Crimson 5 Steamed										
Crimson Cotton 88-1										
Neutral (Fabric)	94 9	-1 1	0 3	1 1	167 1			0 1	0 1	0 1
Lavender	66 8	9 2	-25 0	26 7	290 1			0 5	0 4	0 2
Magenta	51 2	40 3	-22 3	46 1	331 0			0 9	0 4	0 5
Crimson Cotton 88-2										
Neutral (Fabric)	95 0	-1 1	0 3	1 1	165 1			0 1	0 1	0 1
Lavender	67 2	8 9	-24 9	26 4	289 6			0 4	0 4	0 2
Magenta	50 9	40 4	23 1	46 5	330 3			0 9	0 4	0 5
Crimson Cotton 88-3										
Neutral (Fabric)	95 0	-0 9	0 1	0 9	173 3			0 1	0 1	0 1
Lavender	64 8	10 0	27 5	29 3	290 0			0 5	0 5	0 3
Magenta	49.2	39 9	-23 6	46 4	329 5			1 0	0 4	0 5
Crimson Cotton 88-4										
Neutral (Fabric)	95 0	-1 0	0 1	1 0	172 7			0 5	0 1	0 1
Lavender	64 1	10 0	-28 2	29 9	280 5			0 4	0 4	0 2
Magenta	49 3	40 9	23 5	47 2	330 1			1 0	0 5	0 6
Crimson Cotton 88-5										
Neutral (Fabric)	95 1	-1 1	0 1	1 1	174 8			0 1	0 1	0 1
Lavender	63 2	11 3	29 2	31 3	291 1			0 5	0 5	0 3
Magenta	48 5	40 8	-23 5	47 1	330 1			1 0	0 5	0 6
Crimson Cotton 88-6										
Neutral (Fabric)	95 0	-0 9	0.2	1 0	170 3			0.1	0.1	0.1
[illegible]	67.2	8 8	-24 6	26 0	289 8					

00283

Treated, Steamed & Washed

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	DH	Optical Density M	C	Y	Avg
Johnston Cotton 88-1											
Neutral (Fabric)	94.2	-0.6	-0.6	1.0	214.5			0.1	0.1	0.1	0.4
Lavender	64.5	14.1	-29.0	32.2	295.9			0.5	0.4	0.2	1.2
Magenta	50.5	42.7	-24.6	49.2	330.1			1.0	0.4	0.5	1.9
Johnston Cotton 88-2											
Neutral (Fabric)	93.6	-0.8	-0.7	1.0	220.6			0.1	0.1	0.1	0.4
Lavender	66.5	10.4	-25.3	27.4	292.2			0.5	0.4	0.2	1.1
Magenta	52.3	42.0	-24.2	48.5	330.1			0.9	0.4	0.5	1.8
Johnston Cotton 88-3											
Neutral (Fabric)	93.3	0.5	-1.0	1.1	244.1			0.1	0.1	0.1	0.2
Lavender	67.7	11.9	-25.7	28.3	294.8			0.5	0.4	0.2	1.1
Magenta	52.9	41.5	-23.4	47.7	330.6			0.9	0.4	0.5	1.8
Johnston Cotton 88-4											
Neutral (Fabric)	93.1	0.6	-0.5	0.8	217.6			0.1	0.1	0.1	0.3
Lavender	67.1	12.8	-26.0	29.0	296.3			0.5	0.4	0.3	1.2
Magenta	51.7	41.5	-23.8	47.9	330.2			0.9	0.4	0.5	1.8
Johnston Cotton 88-5											
Neutral (Fabric)	93.6	-0.6	-1.0	1.1	239.0			0.1	0.1	0.1	0.2
Lavender	66.7	12.9	-26.3	29.3	296.1			0.5	0.4	0.2	1.1
Magenta	52.2	37.9	-23.4	44.5	324.2			0.9	0.4	0.5	1.8
Johnston Cotton 88-6											
Neutral (Fabric)	93.8	-0.4	1.0	1.0	247.8			0.1	0.1	0.1	0.2
[illegible]	[illegible]	12.2	-28.3	30.8	293.3			[illegible]	0.4	[illegible]	[illegible]
[illegible]	[illegible]	37.7	-23.8	[illegible]	321.7			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	-1.1	[illegible].2	244.5			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible].2	-27.4	[illegible].6	292.3			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	52.8	36.2	-22.7	43.4	329.3			[illegible]	[illegible]	[illegible]	[illegible]

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH
Treated							
Cranston Cotton 88-1							
Neutral (Fabric)	95.0	-1.0	0.*	*.0	173.8		
Lavender	*5.3	-1.5	- 5.3	*5.4	275.8		
Magenta	58.4	30.3	-17.*	34.8	330.7		
Treated & Washed							
Cranston Cotton 88-1							
Neutral (Fabric)	93.3	0.5	-0.9	*.0	297.8	2.5	
Lavender	73.4	6.7	-20.6	21.7	288.0	16.0	
Magenta	58.6	37.*	-22.1	43.2	329.2	3.6	
Treated							
Cranston Cotton 88-2							
Neutral (Fabric)	95.0	-1.0	0.0	1.0	177.6		
Lavender	74.9	2.1	-15.7	*5.9	277.8		
Magenta	58.0	30.6	-*.6	35.5	330.3		
Treated & Washed							
Cranston Cotton 88-2							
Neutral (Fabric)	93.2	0.6	-1.1	1.2	300.3	2.7	
Lavender	73.1	6.9	-21.0	22.1	288.3	7.3	
Magenta	59.0	37.2	-22.9	43.7	328.4	8.3	
Treated							
Cranston Cotton 88-3							
Neutral (Fabric)	95.1	-*.0	0.0	1.0	178.9		
Lavender	75.0	*.3	-15.8	15.8	277.8		
Magenta	58.4	30.7	-17.2	35.2	330.8		
Treated & Washed							
Cranston Cotton 88-3							
Neutral (Fabric)	93.0	0.3	-0.4	0.5	310.9	2.6	
Lavender	74.5	6.6	-19.8	20.6	285.9	6.1	
Magenta	61.6	34.6	-21.3	40.6	328.4	6.5	
Treated							
Cranston Cotton 88-4							
Neutral (Fabric)	95.1	-1.0	0.1	1.0	177.3		
Lavender	75.4	1.4	-15.1	15.1	276.4		
Magenta	58.3	30.9	-16.8	35.2	331.5		
Treated & Washed							
Cranston Cotton 88-4							
Neutral (Fabric)	93.6	0.6	-1.2	1.3	293.1	2.5	
Lavender	74.6	6.7	-20.1	21.2	288.5	7.3	
Magenta	61.0	36.7	-22.1	42.8	328.4	9.3	

6015374.1 10499

C0286

Fabric Type	Color Values L*	a*	b*	C*	h°	DE
Treated						
Cranston Cotton 88-5						
Neutral (Fabric)	95.0	-1.0	0.0	1.0	180.6	
Lavender	74.6	1.7	15.5	15.6	276.3	
Magenta	57.8	31.2	-17.0	35.5	331.4	
Treated & Washed						
Cranston Cotton 88-5						
Neutral (Fabric)	93.2	0.7	-1.2	1.4	296.0	2.7
Lavender	74.1	9.1	-19.4	21.5	295.2	5.3
Magenta	58.8	39.8	-21.6	45.3	331.6	10.8
Treated						
Cranston Cotton 88-6						
Neutral (Fabric)	95.0	-1.0	0.0	1.0	180.3	
Lavender	73.9	3.0	-18.0	18.3	280.6	
Magenta	59.0	34.5	-18.3	39.1	332.1	
Treated & Washed						
Cranston Cotton 88-6						
Neutral (Fabric)	92.7	1.0	-1.3	1.6	306.4	3.3
Lavender	73.2	8.5	-20.9	22.5	292.1	7.4
Magenta	59.2	38.4	-21.4	44.0	330.8	5.9
Treated						
Cranston Cotton 88-7						
Neutral (Fabric)	95.0	-1.0	0.1	1.0	177.2	
Lavender	75.5	1.6	-15.1	15.2	275.9	
Magenta	59.6	31.4	-17.0	35.7	331.6	
Treated & Washed						
Cranston Cotton 88-7						
Neutral (Fabric)	92.5	0.5	-1.2	1.3	290.1	3.2
Lavender	73.2	9.1	-21.3	23.1	293.2	10.0
Magenta	50.6	37.1	-21.8	43.1	329.6	7.7

SDI537H-JJ0H99

Ex. F.S.

Fabric Type	Color Values L*	a*	b*	C*	h°	DE
Treated						
Cranston Cotton 88-1						
Neutral (Fabric)	95.0	-1.0	0.1	1.0	173.8	
Lavender	75.3	-1.5	-15.3	15.4	275.8	
Magenta	58.4	30.3	-17.0	34.8	330.7	
Treated & Steamed						
Cranston Cotton 88-1						
Neutral (Fabric)	94.9	-1.1	0.3	1.1	167.1	0.2
Lavender	66.6	9.2	-25.0	26.7	290.1	16.8
Magenta	51.2	40.3	-22.3	46.1	331.0	13.4
Treated						
Cranston Cotton 88-2						
Neutral (Fabric)	95.0	-1.0	0.0	1.0	177.8	
Lavender	74.9	2.1	-15.7	15.9	277.8	
Magenta	58.0	30.6	-17.6	35.5	330.3	
Treated & Steamed						
Cranston Cotton 88-2						
Neutral (Fabric)	95.0	-1.1	0.3	1.1	165.1	0.2
Lavender	67.2	6.9	-24.9	26.4	289.6	13.7
Magenta	50.9	40.4	-23.1	46.5	330.3	13.1
Treated						
Cranston Cotton 88-3						
Neutral (Fabric)	95.1	-1.0	0.0	1.0	178.9	
Lavender	76.0	1.3	-16.6	15.6	277.8	
Magenta	58.4	30.7	-17.2	35.2	330.8	
Treated & Steamed						
Cranston Cotton 88-3						
Neutral (Fabric)	95.0	-0.9	0.1	0.9	173.3	0.2
Lavender	64.8	10.0	-27.5	29.3	290.0	18.0
Magenta	49.2	39.9	-23.6	46.4	329.5	14.8
Treated						
Cranston Cotton 88-4						
Neutral (Fabric)	95.1	-1.0	0.1	1.0	177.3	
Lavender	75.4	1.4	-15.1	15.1	275.4	
Magenta	58.3	30.9	-16.8	35.2	331.5	
Treated & Steamed						
Cranston Cotton 88-4						
Neutral (Fabric)	95.0	-1.0	0.1	1.0	172.7	0.1
Lavender	64.1	10.0	-28.2	29.9	289.5	19.2
Magenta	49.3	40.9	-23.5	47.2	330.1	15.0

6018374.1 10499

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DE
Treated							
Cranston Cotton 88-5							
Neutral (Fabric)	96.0	-1.0	3.0	3.0	180.8		
Lavender	74.6	1.7	-15.5	15.6	276.3		
Magenta	57.8	31.2	-17.3	35.5	331.4		
Treated & Steamed							
Cranston Cotton 88-5							
Neutral (Fabric)	95.1	-1.1	3.1	3.1	174.6	0.2	
Lavender	83.2	11.3	-29.2	31.3	291.1	47.1	
Magenta	48.5	40.8	-23.8	47.1	330.1	14.8	
Treated							
Cranston Cotton 88-6							
Neutral (Fabric)	95.0	-1.0	0.0	1.0	178.3		
Lavender	73.9	3.0	-16.0	16.3	280.6		
Magenta	56.0	34.6	-18.3	39.1	332.1		
Treated & Steamed							
Cranston Cotton 88-6							
Neutral (Fabric)	95.0	-0.9	0.2	1.0	170.3	0.2	
Lavender	67.2	6.8	-24.5	26.0	289.8	12.3	
Magenta	52.5	38.9	-21.0	44.2	328.6	6.2	
Treated							
Cranston Cotton 88-7							
Neutral (Fabric)	95.0	-1.0	0.1	1.0	177.2		
Lavender	75.5	1.6	-15.1	15.2	275.9		
Magenta	58.6	31.4	-17.0	35.7	331.6		
Treated & Steamed							
Cranston Cotton 88-7							
Neutral (Fabric)	94.9	-1.1	0.5	1.2	155.4	0.5	
Lavender	61.9	10.9	-30.1	32.0	289.9	22.3	
Magenta	49.1	38.4	-23.4	45.0	328.6	13.4	

Fabric Type	Color values L*	a*	b*	C*	h*	DE
Treated & Steamed						
Cranston Cotton 88-1						
Neutral (Fabric)	94.9	-1.1	2.3	1.1	167.1	
Lavender	66.8	5.2	-25.0	26.7	290.1	
Magenta	51.2	40.3	-22.3	46.1	331.0	
Treated, Steamed & Washed						
Cranston Cotton 88-1						
Neutral (Fabric)	94.2	-0.8	-0.8	1.0	214.5	
Lavender	64.5	14.1	-25.0	32.2	299.9	
Magenta	50.6	42.7	-24.6	49.2	330.1	
Treated & Steamed						
Cranston Cotton 88-2						
Neutral (Fabric)	95.0	-1.1	3.3	1.1	165.1	
Lavender	67.2	9.9	-24.9	26.4	288.6	
Magenta	50.5	40.4	-23.1	46.5	330.3	
Treated, Steamed & Washed						
Cranston Cotton 88-2						
Neutral (Fabric)	93.6	-0.8	-0.7	1.0	220.6	1.8
Lavender	68.5	10.4	-25.3	27.4	292.2	2.0
Magenta	52.3	42.0	-24.2	48.5	330.1	2.4
Treated & Steamed						
Cranston Cotton 88-3						
Neutral (Fabric)	95.0	-0.9	3.1	0.9	173.3	
Lavender	64.8	10.0	-27.5	29.3	290.0	
Magenta	49.2	39.6	-23.6	46.4	329.5	
Treated, Steamed & Washed						
Cranston Cotton 88-3						
Neutral (Fabric)	93.3	-0.5	-1.0	1.1	244.1	2.1
Lavender	67.7	11.9	-25.7	28.3	294.6	2.6
Magenta	52.9	41.5	-23.4	47.7	330.6	2.4
Treated & Steamed						
Cranston Cotton 88-4						
Neutral (Fabric)	95.0	-1.0	0.1	1.0	172.7	
Lavender	64.1	10.0	-28.2	29.9	289.8	
Magenta	49.3	40.9	-23.5	47.2	330.1	
Treated, Steamed & Washed						
Cranston Cotton 88-4						
Neutral (Fabric)	93.1	-0.6	-0.5	0.8	217.8	2.0
Lavender	67.1	12.8	-26.0	29.0	296.3	2.8
Magenta	51.7	41.6	-23.8	47.9	330.2	2.5

60163744 .1107499

60839

Fabric Type	Color values L*	a*	b*	C*	h*	
Treated & Steamed						
Cranston Cotton 88-5						
Neutral (Fabric)	35.1	-1.1	3.1	3.3	174.6	
Lavender	33.2	11.3	-29.2	31.3	291.1	
Magenta	48.5	40.8	-23.5	47.1	330.1	
Treated, Steamed & Washed						
Cranston Cotton 88-5						
Neutral (Fabric)	93.6	-0.8	-1.0	1.1	239.0	
Lavender	66.7	12.9	-28.3	29.3	294.7	
Magenta	52.2	37.9	-23.4	44.6	324.2	
Treated & Steamed						
Cranston Cotton 88-6						
Neutral (Fabric)	95.0	-0.9	3.2	3.3	170.3	
Lavender	57.2	8.8	-24.5	26.0	289.8	
Magenta	52.5	38.9	-21.0	44.2	328.6	
Treated, Steamed & Washed						
Cranston Cotton 88-6						
Neutral (Fabric)	93.8	-0.4	-1.0	1.0	247.8	
Lavender	65.0	12.2	-28.3	30.8	293.3	
Magenta	50.4	37.7	-23.8	44.6	327.7	
Treated & Steamed						
Cranston Cotton 88-7						
Neutral (Fabric)	94.9	-1.1	0.5	1.2	155.4	
Lavender	61.9	10.9	-30.1	32.0	289.9	
Magenta	49.1	38.4	-23.4	45.0	328.6	
Treated, Steamed & Washed						
Cranston Cotton 88-7						
Neutral (Fabric)	93.3	-0.8	-1.1	1.2	244.5	
Lavender	65.5	11.2	-27.4	29.6	292.3	
Magenta	52.8	38.2	-22.7	44.4	329.3	

6015374-110499

Fabric Type	Color Values L*	a*	b*	C*	h	Optical Density M	C	Y	Avg
Treated									
Nylon 85% /Lycra 15% 1									
Neutral (Fabric)	94 3	0 7	-6 4	6 4	276 8	0.1	0 1	0 0	0 2
Lavender	72 4	7 1	-19 1	20 4	290 5	0 4	0 4	0 2	1 0
Magenta	50 7	26 4	7 9	27 6	343 2	0 9	0 5	0 7	2 0
Nylon 85% /Lycra 15% 2									
Neutral (Fabric)	94 7	0 9	-6 9	7 0	277 1	0 1	0 1	0 0	0 1
Lavender	74 9	6 2	18 5	19 5	288 5	0 3	0 3	0 2	0 8
Magenta	52 8	25 2	9 4	26 9	339 4	0 8	0 5	0 6	1 9
Nylon 85% /Lycra 15% 4									
Neutral (Fabric)	94 7	0 6	6 2	6 3	275 4	0 1	0 1	0 0	0 2
Lavender	74 2	6 4	-19 7	20 8	288 0	0 3	0 3	0 2	0 9
Magenta	52 9	25 6	-9 7	27 3	339 1	0 8	0 5	0 6	1 9
Nylon 85% /Lycra 15% 5									
Neutral (Fabric)	94 7	0 7	-6 6	6 6	276 2	0 1	0 1	0 0	0 2
Lavender	74 7	6 6	18 4	20 5	288 8	0 3	0 3	0 2	0 8
Magenta	51 3	25 7	0 6	27 5	339 5	0 8	0 4	0 6	1 8
Nylon 85% /Lycra 15% 6									
Neutral (Fabric)	94 7	0 5	-5 8	5 9	274 7	0 1	0 1	0 0	0 2
Lavender	74 5	6 5	19 9	20 0	288 2	0 3	0 3	0 2	0 8
Magenta	52 4	26 6	-9 9	28 3	339 6	0 8	0 5	0 6	1 9

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	DH	Optical Density M	K	Y	Avg
Treated & Washed											
Nylon 85% /Lycra 15% 1											
Neutral (Fabric)	93 2	0 4	-8 4	8 4	272 9			0 1	0 1	0 0	0 2
Lavender	87 2	-0 3	14 3	14 3	268 9			0 1	0 2	0 1	0 4
Magenta	75 8	11 6	18 7	22 0	301 8			0 4	0 3	0 2	0 8
Nylon 85% /Lycra 15% 2											
Neutral (Fabric)	93 2	0 3	8 4	8 4	272 3			0 1	0 1	0 0	0 2
Lavender	89 2	1 9	13 6	13 7	282 0			0 1	0 2	0 0	0 3
Magenta	80 7	8 1	18 4	20 1	293 7			0 3	0 2	0 1	0 6
Nylon 85% /Lycra 15% 4											
Neutral (Fabric)	93 8	0 3	8 4	8 4	272 2			0 1	0 1	0 0	0 2
Lavender	88 6	3 2	13 7	14 1	256 7			0 1	0 2	0 0	0 3
Magenta	84 5	2 2	16 8	16 8	277 4			0 2	0 2	0 1	0 5
Nylon 85% /Lycra 15% 5											
Neutral (Fabric)	93 8	0 4	8 3	8 3	272 5			0 1	0 1	0 0	0 2
Lavender	90 3	3 1	13 0	13 4	256 7			0 1	0 1	0 0	0 3
Magenta	84 3	3 0	17 1	17 3	280 1			0 2	0 1	0 1	0 5
Nylon 85% /Lycra 15% 6											
Neutral (Fabric)	92 9	-0 2	-8 4	8 4	268 6			0 1	0 1	0 0	0 2
Lavender	88 3	3 3	14 3	14 7	257 2			0 1	0 2	0 0	0 4
Magenta	81 4	5 2	19 6	20 3	285 9			0 3	0 3	0 1	0 8

292

Fabric Type	Color Values L*	a*	b*	C*	h°	DF	DH	Optical Density N	C	Y	Avg
Treated & Steamed											
Nylon 86% /Lycra 15% 1											
Neutral (Fabric)	94 4	0 3	5 3	5 3	273 7			0 1	0 1	0 0	0
Lavender	68 5	18 0	23 2	29 2	304 7			0 8	0 5	0 4	1
Magenta	39 5	33 7	1 1	33 7				1 2	0 6	1 0	2
Nylon 86% /Lycra 15% 2											
Neutral (Fabric)	94 1	0 2	4 9	4 9	272 6			0 1	0 1	0 0	0
Lavender	63 7	13 8	23 3	27 1	300 6			0 5	0 4	0 3	1
Magenta	43 3	32 8	-2 2	32 9	356 1			1 2	0 5	0 0	
Nylon 86% /Lycra 15% 4											
Neutral (Fabric)	94 7	0 9	-6 7	6 8	277 3			0 1	0 1	0 0	0
Lavender	63 0	13 4	-25 3	28 6	298 0			0 5	0 4	0 3	1
Magenta	43 4	33 5	-4 8	33 8	352 1			1 1	0 6	0 8	2
Nylon 86% /Lycra 15% 5											
Neutral (Fabric)	94 3	-0 1	-4 1	4 1	269 3			0 1	0 1	0 0	0
Lavender	64 1	13 3	25 0	28 3	298 1			0 5	0 4	0 3	1
Magenta	44 1	33 1	5 0	33 5	351 5			1 1	0 5	0 8	
Nylon 86% /Lycra 15% 6											
Neutral (Fabric)	94 2	0 2	-3 3	3 3	267 3			0 1	0 1	0 0	0
Lavender	66 5	13 8	22 2	26 1	302 0			0 5	0 4	0 3	1
Magenta	45 0	33 0	2 8	33 2	355 1			1 0	0 5	0 8	

00293

293

Fabric Type	Color Values L*	a*	b*	C*	h*	Dh	Optical Density C	Y	Avg
Treated, Steamed & Washed									
Nylon 85% /Lycra 15% 1									
Neutral (Fabric)	93 4	0 0	-6 2	6 2	270 2		0 1	0 0	0
Lavender	85 8	17 2	22 3	28 1	307 6		0 5	0 3	1
Magenta	47 3	35 8	-3 4	35 8	354 6		1 0	0 8	2
Nylon 85% /Lycra 15% 2									
Neutral (Fabric)	93 5	0 2	-6 0	6 0	267 8		0 1	0 0	0
Lavender	87 6	15 9	22 8	27 7	305 2		0 5	0 3	1
Magenta	40 3	34 8	-4 7	35 1	352 1		1 0	0 7	2
Nylon 85% /Lycra 15% 4									
Neutral (Fabric)	93 4	0 0	-6 1	6 1	269 0		0 1	0 0	0
Lavender	88 5	16 3	-23 9	29 0	304 4		0 5	0 2	1
Magenta	50 1	38 4	7 4	37 1	248 5		1 0	0 7	2
Nylon 85% /Lycra 15% 5									
Neutral (Fabric)	93 4	-0 2	-6 1	6 1	268 2		0 1	0 0	0
Lavender	88 0	16 1	23 3	28 3	304 8		0 5	0 2	1
Magenta	51 6	35 3	8 0	36 2	347 1		0 9	0 6	1
Nylon 85% /Lycra 15% 6									
Neutral (Fabric)	93 2	0 7	5 5	5 5	263 0		0 1	0 1	0
Lavender	89 8	15 0	21 4	26 1	301 9		0 1	0 2	1
Magenta	50 5	34 2	-3 8	34 4	353 7		0 0	0 7	2

08234

Fabric Type	Color Values L*	a*	b*	C*	h*	DE
Treated:						
Nylon 85% /Lycra 15% 1						
Neutral (Fabric)	94.3	0.7	-6.4	6.4	276.8	
Lavender	72.4	7.1	-19.1	20.4	290.5	
Magenta	50.7	26.4	-7.9	27.6	343.2	
Treated & Steamed						
Nylon 85% /Lycra 15%						
Neutral (Fabric)	94.4	0.3	-5.3	5.3	273.7	
Lavender	58.5	16.0	-23.2	28.2	304.7	
Magenta	39.5	33.7	[illegible]	33.7		
Treated:						
Nylon 85% /Lycra 15% 2						
Neutral (Fabric)	94.7	0.9	-6.9	7.0	277.1	
Lavender	74.9	6.2	-18.5	19.5	288.5	
Magenta	52.8	25.2	-8.4	26.9	339.4	
Treated & Steamed						
Nylon 85% /Lycra 15% 2						
Neutral (Fabric)	94.4	0.2	-4.9	4.9	272.8	2
Lavender	63.7	13.8	-23.3	27.1	300.6	14
Magenta	43.3	32.8	-2.2	32.9	356.1	14
Treated						
Nylon 85% /Lycra 15% 4						
Neutral (Fabric)	94.7	0.6	-6.2	6.3	275.4	
Lavender	74.2	6.4	-19.7	20.8	288.0	
Magenta	52.9	25.6	-9.7	27.3	339.1	
Treated & Steamed						
Nylon 85% /Lycra 15% 4						
Neutral (Fabric)	94.7	0.9	-8.[illegible]	8.8	277.3	0
Lavender	63.0	13.4	-25.3	28.6	298.0	14
Magenta	43.4	33.5	-4.6	33.8	352.1	13
Treated						
Nylon 85% /Lycra 15% 5						
Neutral (Fabric)	94.7	0.7	-6.6	6.6	276.2	
Lavender	74.7	6.6	-18.4	20.5	286.8	
Magenta	53.3	25.7	-9.6	27.5	339.5	
Treated & Steamed						
Nylon 85% /Lycra 15% 6						
Neutral (Fabric)	94.3	-0.1	-4.1	4.1	269.3	7
Lavender	64.1	13.3	-25.0	28.3	298.1	14
Magenta	44.3	33.1	-5.0	33.5	351.5	12

6016374.1 10499

Type TS

Fabric Type	Color Values L*	a*	b*	C*	h*	DE
Treated						
Nylon 85% /Lycra 15% S						
Neutral (Fabric)	94.7	0.5	-5.8	5.9	274.7	
Lavender	72.5	6.5	-19.9	20.9	288.2	
Magenta	52.4	28.6	-5.9	28.3	339.6	
Treated & Steamed						
Nylon 85% /Lycra 15% S						
Neutral (Fabric)	94.2	-0.2	-3.3	3.3	267.3	
Lavender	86.5	13.8	-22.2	26.1	302.0	
Magenta	45.6	33.0	-2.8	33.2	355.1	

60163744.110499

Fabric Type	Color Values L*	a*	b*	C*	h°	DE
Treated						
Nylon 85% /Lycra 15%						
Neutral (Fabric)	94.3	0.7	-6.4	6.4	276.6	
Lavender	72.4	7.1	-19.1	20.4	290.5	
Magenta	50.7	25.4	-7.9	27.6	343.2	
Treated & Washed						
Nylon 85% /Lycra 15%						
Neutral (Fabric)	93.2	0.4	-8.4	8.4	272.9	2.2
Lavender	67.2	-0.3	-14.3	14.3	268.6	17.2
Magenta	75.8	11.8	-18.7	22.0	301.8	31.1
Treated						
Nylon 85% /Lycra 15% 2						
Neutral (Fabric)	94.7	0.9	-6.9	7.0	277.1	
Lavender	74.9	6.2	-18.5	19.5	288.5	
Magenta	52.8	25.2	-9.4	26.9	339.4	
Treated & Washed						
Nylon 85% /Lycra 15% 2						
Neutral (Fabric)	93.2	0.3	-8.4	8.4	272.3	2.2
Lavender	69.2	-1.9	-13.6	13.7	262.0	17.1
Magenta	80.7	8.1	-18.4	20.1	293.7	33.9
Treated						
Nylon 85% /Lycra 15% 4						
Neutral (Fabric)	94.7	0.6	-6.2	6.3	275.4	
Lavender	74.2	6.4	-19.7	20.8	288.0	
Magenta	52.9	25.6	-8.7	27.3	339.1	
Treated & Washed						
Nylon 85% /Lycra 15% 4						
Neutral (Fabric)	93.8	0.3	-8.4	8.4	272.2	2.4
Lavender	69.6	-3.2	-13.7	14.1	256.7	19.1
Magenta	84.5	2.2	-16.6	16.8	277.4	38.9
Treated						
Nylon 85% /Lycra 15% 5						
Neutral (Fabric)	94.7	0.7	-6.6	6.6	276.2	
Lavender	74.7	6.6	-18.4	20.5	288.8	
Magenta	53.3	25.7	-9.6	27.5	338.5	
Treated & Washed						
Nylon 85% /Lycra 15% 5						
Neutral (Fabric)	93.8	0.4	-8.3	8.3	272.5	1.9
Lavender	90.3	-3.1	-13.0	13.4	256.7	19.1
Magenta	84.3	3.0	-17.1	17.3	280.1	38.7

5015374-110499

297

Fabric Type	Color values L*	a*	b*	C*	h*	dE
Treated						
Nylon 85% /Lycra 15% S						
Neutral (Fabric)	94.7	0.5	-5.8	5.9	274.7	
Lavender	74.5	8.5	-19.9	20.9	288.2	
Magenta	52.4	29.6	-9.9	28.3	339.6	
Treated & Washed						
Nylon 85% /Lycra 15% S						
Neutral (Fabric)	92.9	-0.2	-3.4	8.4	268.6	3.1
Lavender	89.3	-3.3	-14.3	14.7	257.2	19.3
Magenta	81.4	5.2	-19.6	20.3	285.9	37.2

U0298

6016374.1 110499

Fabric Type	Color Values L*	a*	b*	C*	h*
Treated & Steamed					
Nylon 85% /Lycra 15% 1					
Neutral (Fabric)	94.4	0.3	-5.3	5.3	273.7
Lavender	58.5	16.0	-23.2	28.2	304.7
Magenta	39.5	33.7	-1.1	33.7	
Treated, Steamed & Washed					
Nylon 85% /Lycra 15% 1					
Neutral (Fabric)	93.4	0.0	-8.2	8.2	270.2
Lavender	65.8	17.2	-22.3	28.1	307.9
Magenta	47.3	35.6	-3.4	35.8	354.4
Treated & Steamed					
Nylon 85% /Lycra 15% 2					
Neutral (Fabric)	94.4	0.2	-4.9	4.9	272.8
Lavender	63.7	13.8	-23.3	27.1	300.6
Magenta	43.3	32.8	-2.2	32.9	356.1
Treated, Steamed & Washed					
Nylon 85% /Lycra 15% 2					
Neutral (Fabric)	93.5	-0.2	-6.0	6.0	267.8
Lavender	67.6	15.9	-22.6	27.7	305.2
Magenta	49.3	34.8	-4.7	35.1	352.3
Treated & Steamed					
Nylon 85% /Lycra 15% 4					
Neutral (Fabric)	94.7	0.9	-6.7	6.8	277.3
Lavender	63.0	13.4	-25.3	28.6	298.0
Magenta	43.4	33.5	-4.6	33.8	352.1
Treated, Steamed & Washed					
Nylon 85% /Lycra 15% 4					
Neutral (Fabric)	93.4	0.0	-5.1	5.1	269.9
Lavender	68.5	16.3	-23.9	29.0	304.4
Magenta	50.1	36.4	-7.4	37.1	348.5
Treated & Steamed					
Nylon 85% /Lycra 15% 5					
Neutral (Fabric)	94.3	-0.1	-4.1	4.1	268.6
Lavender	64.1	13.3	-25.0	28.3	298.4
Magenta	44.3	33.1	-5.0	33.5	351.2
Treated, Steamed & Washed					
Nylon 85% /Lycra 15% 5					
Neutral (Fabric)	93.4	-0.2	-6.1	6.1	268.2
Lavender	68.9	16.1	-23.3	28.3	304.8
Magenta	51.6	36.3	-8.0	38.2	347.3

6015374.1 110499

T.S. vs T.S.W.

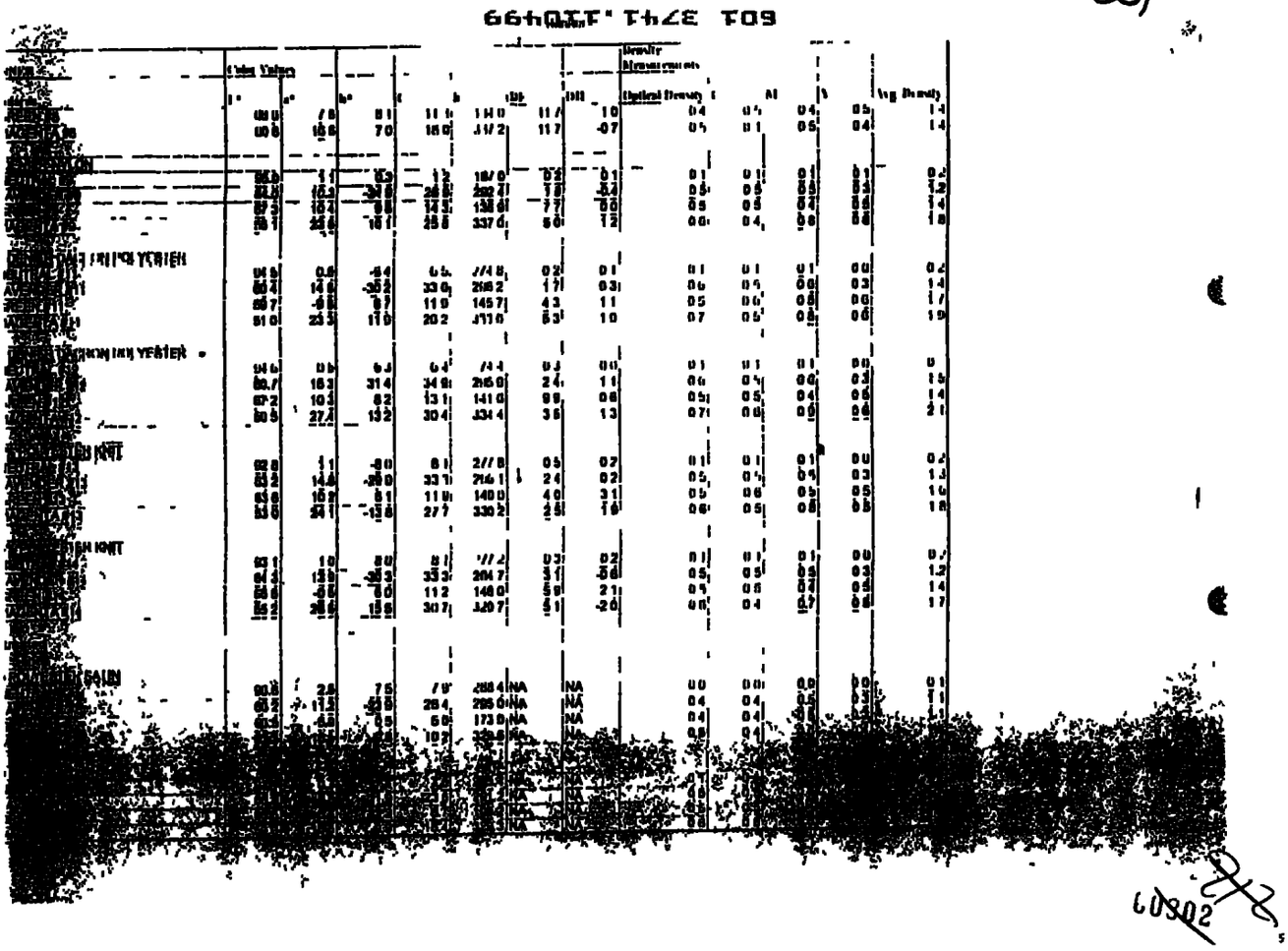
Fabric Type	Color Values L*	a*	b*	C*	h*		
Treated & Steamed							
Nylon 85% /Lycra 15% S							
Neutral (Fabric)	94.2	-0.2	-3.3	3.3	267.9		
Lavender	66.5	13.8	-22.2	26.1	302.0		
Magenta	45.6	33.0	-2.9	33.2	355.1		
Treated, Steamed & Washed							
Nylon 85% /Lycra 15% S							
Neutral (Fabric)	93.2	-0.7	-5.5	5.5	263.0		
Lavender	69.8	15.0	-21.4	26.1	304.9		
Magenta	50.5	34.2	-3.8	34.4	353.5		

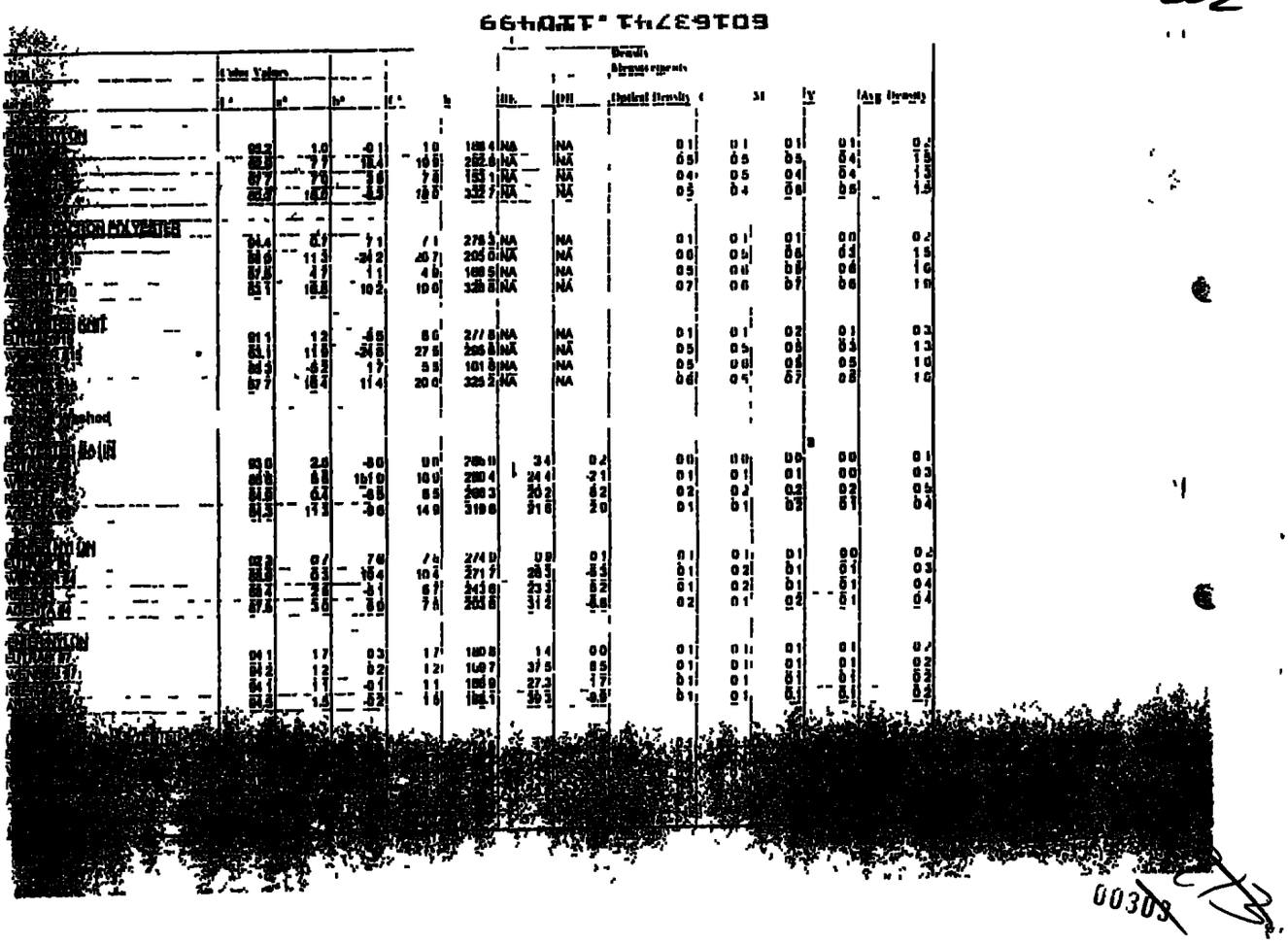
6018374-111049

300 24

6038

6037411 JUN 69



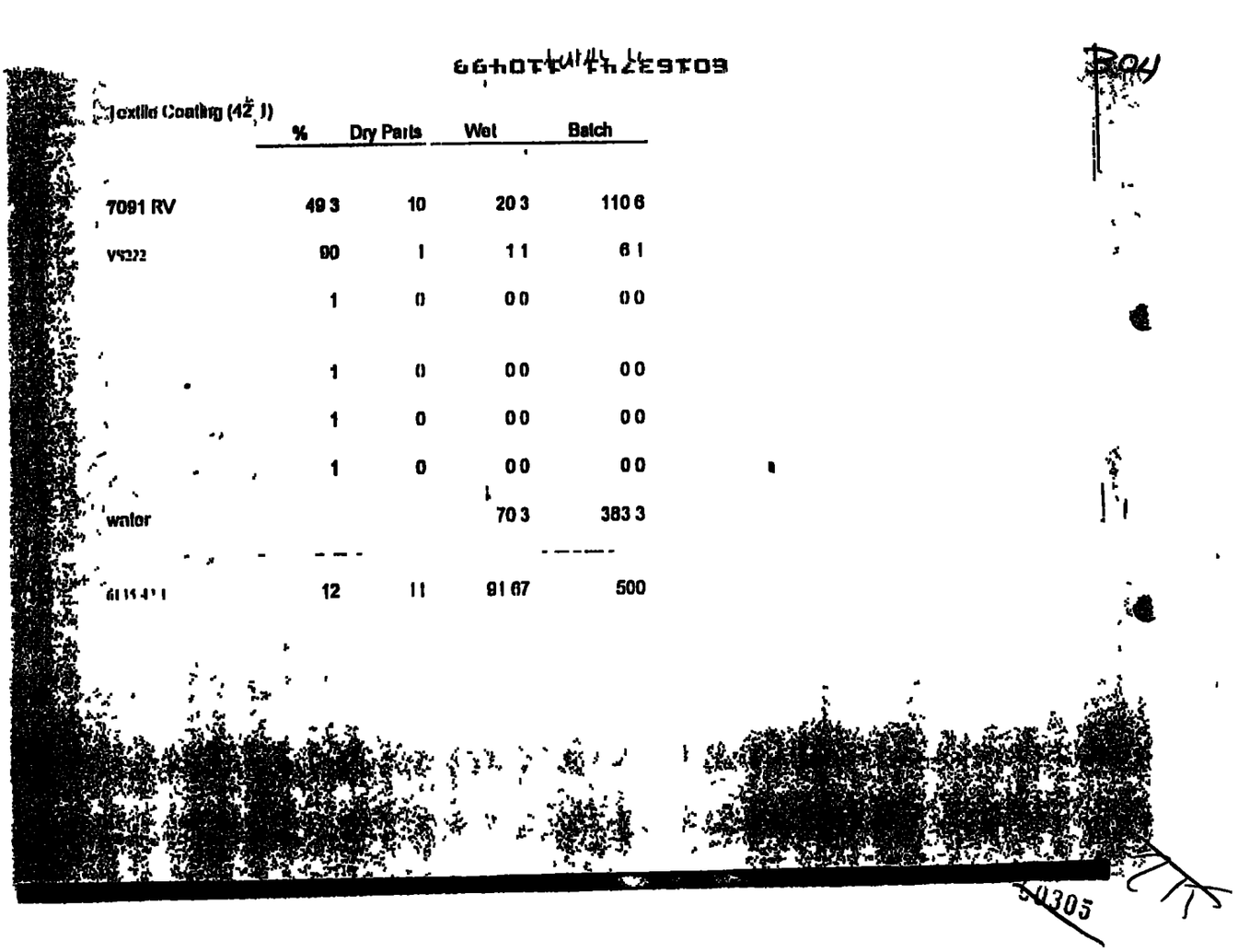


	Color Values							Density Measurement					
	L*	a*	b*	c*	h°	Dk	Dm	Optical Density					Log Density
	99.0	0.0	-0.6	0.6	270.0	0.3	-0.2	0.11	0.1	0.1	0.1	0.1	0.1
	79.0	5.2	17.1	17.8	287.0	18.4	-3.2	0.3	0.3	0.3	0.3	0.3	0.3
	74.0	1.2	-5.1	5.2	283.0	15.1	-2.5	0.4	0.4	0.4	0.4	0.4	0.4
	79.3	11.3	-12.2	16.6	312.0	13.0	-4.0	0.4	0.4	0.4	0.4	0.4	0.4

60304

Textile Coating (42 J)

	%	Dry Parts	Wet	Batch
7091 RV	49 3	10	20 3	110 6
V9222	90	1	1 1	6 1
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			70 3	383 3
[illegible]	12	11	91 67	500



Textile Coating (73R)

	%	Dry Parts	Wet	Batch
7091 RV	49 3	10	20 3	110 6
Aniogen 412	4 44	1	22 5	122 9
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			48 9	266 5
5753 71 II	12	11	91 67	500

Textile Coating (730)

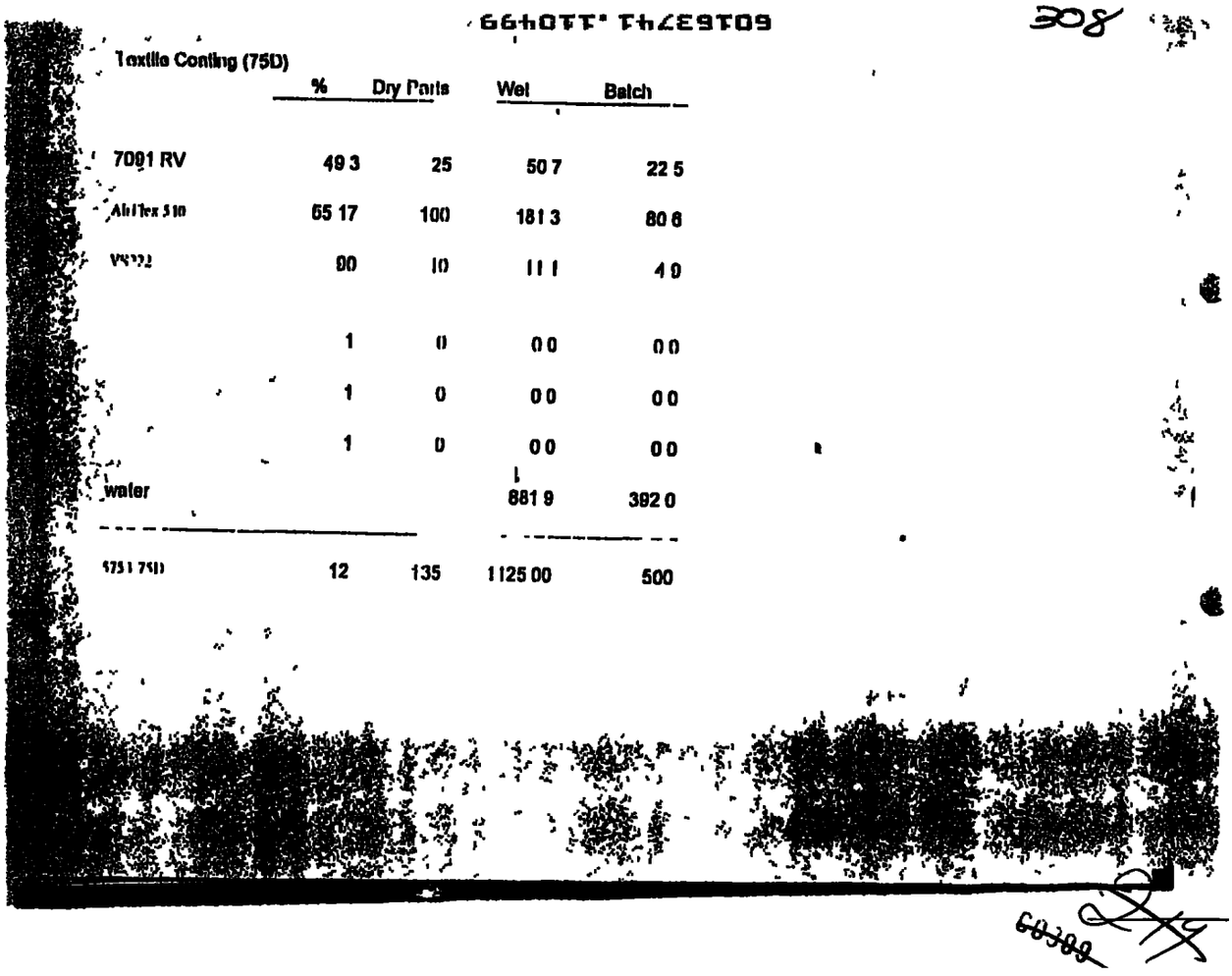
	%	Dry Parts	Wet	Batch
7091 RV	49 3	10	20 3	1106
Aerosil 150	4 32	1	23 1	126 3
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			48 2	263 1
	12	11	91 67	500

Textile Coating (73D)

	%	Dry Parts	Wet	Batch
7091 RV	40 3	10	20 3	110 6
Aluwax 11 (Super 100)	4 4	1	22 7	124 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			48 7	265 4
[illegible]	12	11	91 87	500

Textile Coating (75D)

	%	Dry Parts	Wet	Batch
7091 RV	49 3	25	50 7	22 5
AirTex 510	65 17	100	181 3	80 6
[illegible]	90	10	111	4 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			881 9	392 0
[illegible]	12	135	1125 00	500



[illegible]		28	50 7	22 5
Akflex 540	55 17	100	181 3	80 6
[illegible]	80 7	10	15 0	6 7
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			876 0	390 2
[illegible]	12	135	1125 00	500

			26	157.2
	47	1	21 3	116 1
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			41 6	226 8
	12	11	91 67	500

			Wei	Batch
	12	10	233	126 9
W122	47	1	213	116 1
	1	0	00	00
	1	0	00	00
	1	0	00	00
	1	0	00	00
water			47 1	257 0
1751 86 1	12	11	9167	500

			Wat	Jantell
			203	1106
Ahmel	11	1	00	483
	1	0	00	00
	1	0	00	00
	1	0	00	00
	1	0	00	00
wate			625	3411
[illegible]	12	11	1107	400

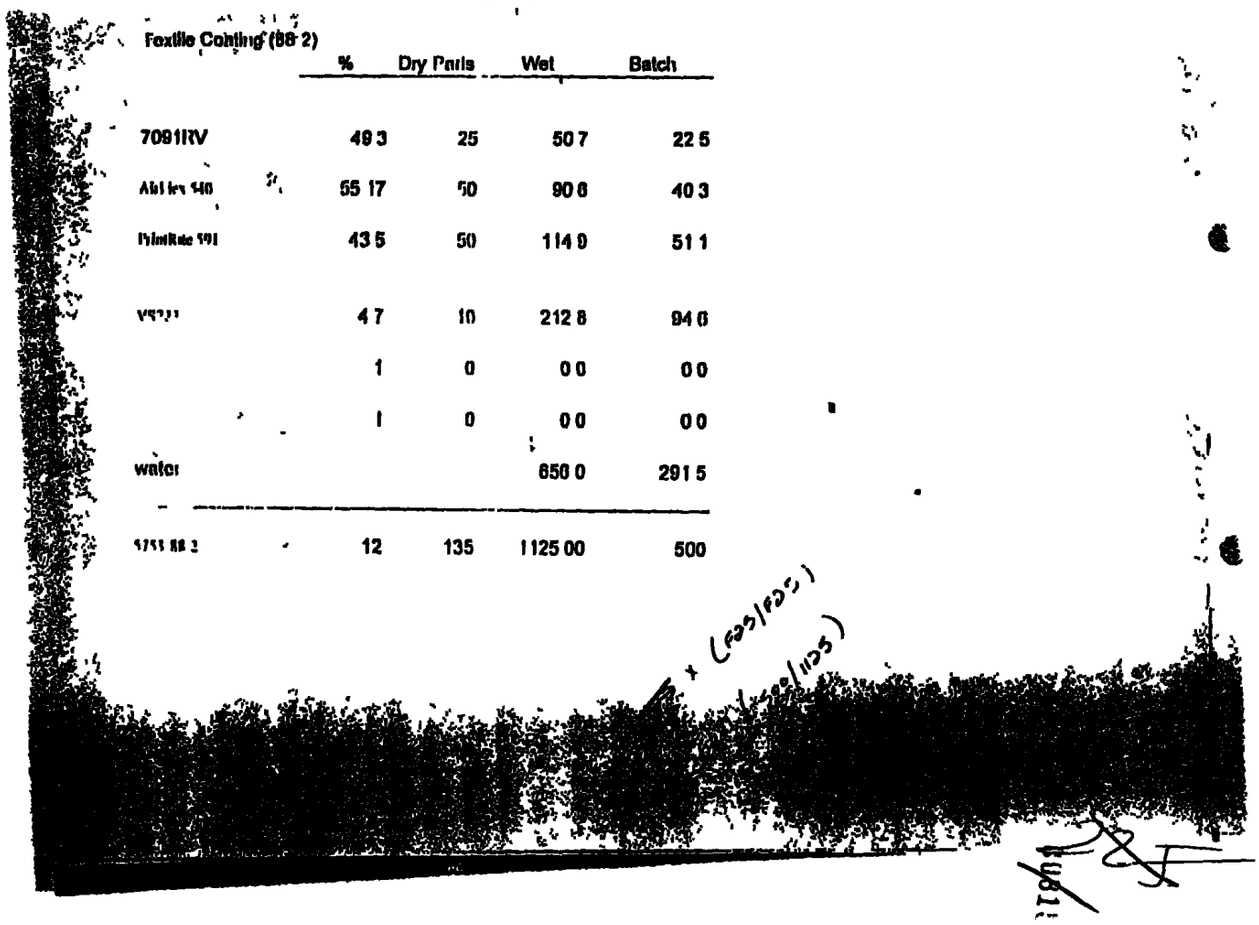
Textile Coating (88-1)

	%	Dry Parts	Wet	Batch
7091RV	40 3	25	50 7	22 5
Aldrich 4th	55 17	50	90 6	40 3
PrintRite 395	43 5	50	114 9	51 1
[illegible]	4 7	10	212 8	94 6
	1	0	0 0	0 0
	1	0	0 0	0 0
water			656 0	291 5
[illegible]	12	135	1125 00	500

EXHIBIT 31

Textile Coating (88 2)

	%	Dry Parts	Wet	Batch
7091RV	49 3	25	50 7	22 5
Ab l ev 140	55 17	50	90 6	40 3
Printkote 191	43 5	50	114 9	51 1
V9?2?	4 7	10	212 8	94 6
	1	0	0 0	0 0
	1	0	0 0	0 0
water			650 0	291 5
9?55 88 2	12	135	1125 00	500



66hOTT' Th∠E9TO9

Textile Coating (88-3)	%	Dry Parts	Wet	Batch
7091RV	49 3	5	10 1	55 3
	1	0	0 0	0 0
Primitle 991	43 5	5	11 5	62 7
V5??2	4 7	1	21 3	116 1
	1	0	0 0	0 0
	1	0	0 0	0 0
water			48 8	265 9
5751 88 1	12	11	91 67	500



Textile Coating (88-4)

	%	Dry Parts	Wet	Batch
7001RV	49 3	5	10 1	55 3
	1	0	0 0	0 0
[illegible]	43 5	5	11 5	62 7
[illegible]	4 7	1	2 1 3	11 6 1
	1	0	0 0	0 0
	1	0	0 0	0 0
water			48 8	265 9
[illegible]	12	11	91 07	500

Textile Coating (88 5)

	%	Dry Parts	Wet	Batch
7091RV	49 3	5	10 1	55 3
	1	0	0 0	0 0
Ahlbrs 140	55 17	6	9 1	49 4
[illegible]	4 7	1	21 1	116 1
	1	0	0 0	0 0
	1	0	0 0	0 0
water			51 2	279 2
[illegible]	12	11	91 07	500

Textile Coating (91 5)

	%	Dry Parts	Wet	Batch
7091RV (Cationic)	49 1	25	50 7	14 5
	1	0	0 0	0 0
PrintRite 391	43 1	100	230 9	66 0
V5175	6 75	20	296 3	84 7
	1	0	0 0	0 0
	1	0	0 0	0 0
water			993 5	283 9
[illegible]	7	110	1571 43	449

SILK CHARMEUSE DRY CLEANING TESTS

	330	129	12	130	354.9						
Magenta	469	548	-52	551	354.6			0.7	1.2	0.4	0.8
Orange	475	513	350	621	34.3			0.8	1.2	0.3	1.3
Red	451	521	273	588	27.6			0.7	1.2	0.4	1.2
Black 1	201	18	0.5	1.9	14.0			1.2	1.2	1.2	1.2
Yellow	830	50	918	920	86.9			0.1	0.2	0.1	1.1
Green	557	-351	451	571	127.9			0.6	0.8	0.9	1.1
Cyan	618	279	-312	419	228.2			0.7	-0.4	1.0	0.2
Blue	341	119	251	278	295.4			1.1	1.2	1.1	0.8
Black 2	101	41	-6.0	7.9	303.4			1.2	1.2	1.2	1.1
Average	1.1	190	277	538	308.2			1.1	1.2	1.0	0.8
FABRITE 88-2 DRY CLEAN #1											
Burgundy	305	117	1.0	118	352.5	3.6	0.5	1.2	1.3	1.0	1.2
Magenta	447	546	5.0	548	354.0	2.3	0.2	0.7	1.2	0.4	0.8
Orange	452	501	346	606	34.6	2.6	0.3	0.7	1.2	0.3	1.3
Red	430	513	272	581	27.0	2.1	0.3	0.7	1.3	0.9	1.3
Black 1	277	1.4	0.3	1.5	148.0	2.0	0.7	1.3	1.3	1.3	0.1
Yellow	821	1.7	903	905	87.0	1.9	0.2	0.2	0.2	0.1	1.1
Green	552	153	442	600	128.0	1.1	0.7	0.7	0.5	0.9	0.2
Cyan	608	285	208	412	228.3	1.8	1.4	0.7	0.4	1.0	0.3
Blue	337	113	248	273	294.5	0.8	0.4	1.1	1.2	1.1	0.8
Black 2	280	1.6	6.9	7.8	298.0	1.4	0.7	1.2	1.3	1.2	1.1
Average	1.1	190	273	537	304.8	1.1	0.8	1.2	1.1	1.1	0.8
91-4											
Burgundy	139	137	-2.0	139	351.6			1.0	1.2	0.5	1.1
Magenta	408	547	-6.0	550	353.7			0.7	1.2	0.4	0.8
Orange	476	507	347	614	34.4			0.6	1.1	0.5	1.3
Red	455	517	259	578	28.6			0.7	1.2	0.5	1.2
Black 1	115	1.6	0.3	1.6	114			1.1	1.1	1.1	1.1
Yellow	810	48	906	907	87.0			0.1	0.2	0.1	1.1
Green	577	350	444	566	128.2			0.6	0.4	0.8	1.1
Cyan	611	201	401	476	228.1			0.8	0.4	1.0	0.9

60163741.110499

SILK CHARMEUSE
DYE STAINING TESTS

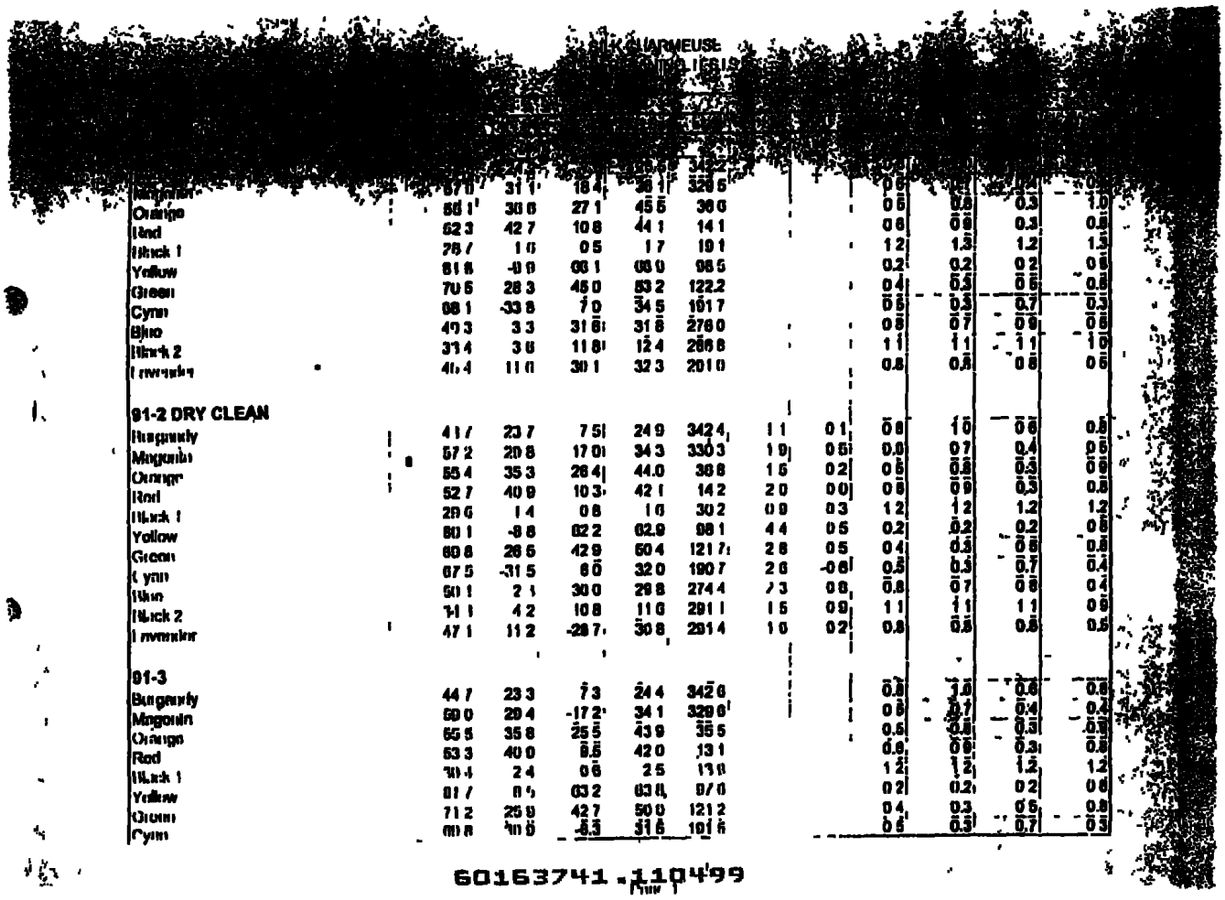
Average	314	152	27.8	83.8	304.8						
91-4L DRY CLEAN											
Burgundy	372	126	23	12.7	348.6	2.2	-0.6	1.1	1.2	1.0	1.1
Magenta	469	53.8	5.0	54.1	354.0	1.3	0.3	0.7	1.2	0.4	0.8
Orange	407	40.9	34.3	80.6	34.5	1.3	0.1	0.7	1.2	0.3	1.3
Red	44.0	60.5	25.4	58.5	26.7	1.8	0.2	0.7	1.2	0.4	1.2
Black 1	28.8	1.3	0.0	1.3	356.6	2.8	0.3	1.2	1.2	1.2	1.2
Yellow	81.1	1.7	86.0	86.0	87.9	1.8	1.3	0.2	0.2	0.1	1.1
Green	66.1	34.7	43.3	55.4	128.7	1.8	0.5	0.6	0.6	0.9	1.1
Cyan	61.6	20.4	-27.5	40.1	223.1	1.2	2.2	0.6	0.4	1.0	0.3
Blue	35.3	10.4	24.9	27.0	202.8	1.5	-0.3	1.1	1.1	1.1	0.8
Black 2	20.5	3.6	-0.7	7.6	296.1	2.2	0.0	1.2	1.2	1.2	1.1
Invisible	31.7	19.1	27.0	33.1	305.3	0.9	0.3	1.1	1.2	1.0	0.8
91-4H											
Burgundy	31.6	13.6	2.1	13.8	351.1			1.1	1.2	1.0	1.1
Magenta	45.9	56.1	5.6	56.4	354.4			0.7	1.2	0.4	0.8
Orange	47.0	51.8	35.8	63.0	34.7			0.6	1.2	0.3	1.3
Red	41.7	52.3	27.0	58.9	27.3			0.7	1.2	0.4	1.2
Black 1	20.8	1.8	0.1	1.8	3.6			1.2	1.2	1.2	1.2
Yellow	84.0	4.8	92.8	92.8	87.1			0.1	0.2	0.1	1.1
Green	67.1	35.5	40.2	58.3	127.5			0.6	0.5	0.9	1.1
Cyan	63.0	20.8	30.4	42.5	225.8			0.6	0.4	1.0	0.2
Blue	36.2	11.8	20.2	28.7	284.2			1.1	1.1	1.0	0.7
Black 2	20.7	4.1	-6.9	8.0	300.5			1.2	1.2	1.2	1.1
Invisible	31.6	20.3	28.0	34.6	305.0			1.1	1.2	1.0	0.8
91-4H DRY CLEAN											
Burgundy	20.1	12.3	2.2	12.5	340.0	2.0	0.3	1.2	1.3	1.1	1.2
Magenta	41.7	55.8	4.9	56.0	355.0	1.4	0.6	0.7	1.3	0.4	0.8
Orange	15.2	50.1	35.1	61.7	34.7	2.2	0.1	0.7	1.2	0.4	1.4
Red	11.2	52.6	27.0	60.4	28.0	1.8	0.7	0.7	1.3	0.4	1.3

60163741 110409

09321

SILKSCREEN/EUSL
DRY CLEANING TESTS

Green	681	-350	449	67.0	1280	26	04	07	0.5	0.6	0.4
Cyan	806	-296	-275	405	2232	36	19	07	0.4	1.0	0.3
Blue	329	119	-255	281	2950	24	0.4	1.2	1.2	1.1	0.8
Black 2	273	40	-66	76	3017	25	02	15	1.3	1.3	1.2
Invisible	320	200	-277	341	3050	10	00	1.2	1.3	1.0	0.8
91 1											
Burgundy	443	236	79	249	3415			08	1.0	0.6	0.6
Magenta	587	303	183	154	1289			05	0.7	0.4	0.4
Orange	461	357	268	445	306			0.6	0.8	0.3	0.9
Red	530	415	100	427	135			06	0.9	0.3	0.6
Black 1	209	18	07	19	20.8			1.2	1.2	1.2	1.2
Yellow	824	100	647	685	88.8			0.2	0.2	0.2	0.8
Green	714	-278	444	52.4	1220			04	0.5	0.6	0.8
Cyan	606	-322	-60	329	1916			06	0.3	0.7	0.3
Blue	517	20	-305	308	2749			08	0.7	0.8	0.4
Black 2	357	36	-119	125	2875			11	1.1	1.0	0.9
Invisible	487	109	296	315	2903			08	0.8	0.8	0.5
91-1 DRY CLEAN											
Burgundy	416	213	-72	263	3434	10	08	08	1.0	0.6	0.8
Magenta	578	298	159	338	3320	26	19	06	0.7	0.4	0.5
Orange	558	348	266	430	370	12	07	05	0.8	0.3	0.9
Red	528	404	97	417	135	13	00	06	0.9	0.3	0.8
Black 1	204	15	06	16	211	06	00	12	1.2	1.2	1.2
Yellow	804	08	627	632	972	30	19	02	0.2	0.2	0.8
Green	709	-240	442	503	1185	36	-32	04	0.3	0.5	0.8
Cyan	686	-304	58	309	1909	23	0.4	05	0.3	0.7	0.3
Blue	517	15	283	284	2730	24	-10	0.8	0.7	0.8	0.4
Black 2	352	40	113	120	2897	09	08	11	1.1	1.0	0.9
Invisible	478	111	282	303	2916	18	07	0.8	0.8	0.8	0.6



	871	311	184	361	3265			0.6		0.3	1.0
Orange	861	306	271	455	366			0.6	0.6	0.3	0.8
Red	823	427	108	441	141			0.6	0.6	0.3	0.8
Black 1	787	16	05	17	191			1.2	1.3	1.2	1.3
Yellow	818	-09	061	060	985			0.2	0.2	0.2	0.6
Green	705	283	450	832	1222			0.4	0.5	0.6	0.8
Cyan	981	-338	70	345	1017			0.5	0.5	0.7	0.5
Blue	403	33	318	318	2780			0.6	0.7	0.6	0.6
Black 2	314	36	118	124	2668			1.1	1.1	1.1	1.0
Lavender	464	110	301	323	2010			0.8	0.8	0.8	0.6
91-2 DRY CLEAN											
Burgundy	417	237	75	249	3424	11	01	0.6	1.0	0.6	0.8
Magenta	572	208	170	343	3303	19	05	0.8	0.7	0.4	0.6
Orange	554	353	264	440	368	15	02	0.5	0.8	0.5	0.6
Red	527	409	103	421	142	20	00	0.6	0.6	0.3	0.8
Black 1	286	14	08	10	302	09	03	1.2	1.2	1.2	1.2
Yellow	801	-86	822	829	981	44	05	0.2	0.2	0.2	0.6
Green	606	266	429	504	1217	26	05	0.4	0.5	0.6	0.8
Cyan	675	-315	60	320	1907	26	-06	0.5	0.5	0.7	0.4
Blue	501	21	300	298	2744	23	06	0.8	0.7	0.6	0.4
Black 2	141	42	108	110	2911	15	09	1.1	1.1	1.1	0.6
Lavender	471	112	-287	308	2914	10	02	0.8	0.8	0.8	0.5
91-3											
Burgundy	447	233	73	244	3426			0.8	1.0	0.6	0.8
Magenta	590	294	-172	341	3298			0.6	0.7	0.4	0.4
Orange	555	358	255	439	355			0.5	0.8	0.3	0.8
Red	533	400	85	420	131			0.6	0.6	0.3	0.8
Black 1	304	24	06	25	138			1.2	1.2	1.2	1.2
Yellow	817	84	832	838	970			0.2	0.2	0.2	0.6
Green	712	259	427	500	1212			0.4	0.3	0.6	0.8
Cyan	618	310	53	316	1016			0.6	0.3	0.7	0.3

SILK CHARMEUSE
CLEANING TEST

Lavender	48.4	11.7	-36.9	31.2	297.0			0.8	0.9	0.8	0.5
91-3 DRY CLEAN											
Burgundy	44.1	23.4	7.9	24.6	341.4	0.8	0.5	0.8	1.0	0.8	0.8
Magenta	57.8	28.7	10.0	32.8	130.8	1.0	0.7	0.5	0.7	0.4	0.5
Orange	51.8	15.0	24.3	42.6	34.7	1.5	0.0	0.5	0.8	0.3	0.9
Red	52.6	39.8	9.2	40.8	13.0	1.3	-0.1	0.6	0.9	0.3	0.8
Black 1	30.1	2.2	0.3	2.2	7.3	0.5	-0.3	1.2	1.2	1.1	1.2
Yellow	80.2	-9.0	60.4	61.1	98.5	3.3	0.9	0.2	0.2	0.2	0.8
Green	60.7	20.0	41.4	48.9	142.1	2.1	0.8	0.4	0.3	0.5	0.8
Cyan	68.1	30.6	5.7	31.2	190.6	1.8	0.5	0.5	0.3	0.7	0.3
Blue	60.2	7.1	28.6	28.8	278.2	2.1	-0.2	0.8	0.7	0.8	0.5
Black 2	34.2	5.1	11.3	12.4	20.4.2	1.4	-0.1	1.1	1.1	1.1	1.0
Lavender	47.2	11.4	28.2	30.4	292.0	1.4	0.0	0.8	0.8	0.8	0.5
91-5L											
Burgundy	34.1	13.0	2.1	13.8	351.3			1.0	1.2	0.9	1.0
Magenta	46.8	54.1	5.5	54.3	354.2			0.7	1.2	0.4	0.8
Orange	17.8	49.9	33.5	60.1	33.9			0.6	1.1	0.3	1.2
Red	45.1	50.9	24.9	56.7	20.1			0.7	1.2	0.4	1.2
Black 1	31.1	1.4	0.4	1.5	17.1			1.1	1.2	1.1	1.2
Yellow	81.6	4.8	86.8	86.9	86.9			0.1	0.2	0.1	1.1
Green	57.0	34.9	42.7	55.1	120.2			0.6	0.4	0.6	1.1
Cyan	62.6	29.5	31.1	42.8	226.5			0.6	0.4	1.0	0.2
Blue	38.3	10.1	25.5	27.4	291.5			1.1	1.1	1.0	0.7
Black 2	31.6	3.3	0.8	7.6	20.5.8			1.1	1.2	1.1	1.0
Lavender	34.6	16.3	-27.1	32.7	303.9			1.1	1.2	1.0	0.8
91-5L DRY CLEAN											
Burgundy	11.7	11.6	2.9	11.9	346.8	2.4	1.2	1.1	1.2	1.0	1.1
Magenta	47.6	52.5	7.6	53.0	351.7	2.6	2.3	0.7	1.1	0.4	0.7
Orange	46.6	46.6	33.2	57.2	35.5	3.4	1.7	0.6	1.1	0.3	1.2
Red	46.1	46.1	24.0	53.6	26.6	3.1	0.4	0.7	1.2	0.4	1.1

60163741.110499

L0324

SIDX CHARMEUSE

		74 0									
Drum	66 0	-34 8	42 8	56 2	129 2	1 0	0 1	0 8	0 1	0 9	0 0
Lycra	63 1	-30 2	27 7	41 0	225 5	1 5	-2 9	0 8	0 4	1 0	0 2
Blue	304	9 7	-26 4	27 2	290 8	0 4	-0 3	1 1	1 1	1 0	0 7
Black 2	300	2 9	7 1	7 7	291 8	1 2	0 5	1 2	1 2	1 2	1
Average	74 8	16 3	27 6	33 1	303 5	0 5	-0 2	1 1	1 2	1 0	0 8

60163741.110499

00325

LOWIK 8

POLY SATIN

	88.4	14 8	58.6	31.8	297.8			0.8	0.8	0.8	0.8
Black 1	43 4	5.2	-5.0	5.6	302 4			0.8	0.8	0.7	0.8
Blue	55 6	5 1	-26.2	25.7	281.4			0.8	0.8	0 7	0.8
Cyan	70 6	-19.4	-31.8	37.3	238.0			0.4	0.2	0 6	0.5
Green	73.6	-31 6	29 6	43 6	136 7			0.1	0.1	0 1	0.5
Yellow	91 4	-5 9	59.8	60 6	90 4			1.0	1.0	0 8	1.0
Black 2	36.5	1 3	1 3	1 8	44.8			0.4	0.7	0.2	0.8
Red	63 6	33 9	13 9	38 7	22.3			0.4	0.8	0 2	0.7
Orange	66.8	26 2	24.8	37.5	41 3			0 4	0 7	0.2	0.7
Magenta	64 6	41 8	14.0	44 0	141 5			0.7	0.8	0.6	0.8
Brown	40 0	11 8	1.8	11 9	352 6			0.1	0.0	0 1	0.0
Neutral	9 7	1 0	5.0	5.1	280 8						
FR POLY SATIN DOUBLE STRIKE											
Lavender	40 3	16 3	-33 1	36 9	296 3			0.9	0.8	0.8	0 5
Black 1	29 7	3 2	1 1	3.4	341 4			1.2	1.2	1 2	1.2
Blue	44 4	5 3	-24 4	26 0	282 2			0.8	0.8	0 9	0 8
Cyan	65 1	-22 5	-37 1	43.4	236 8			0.8	0.4	0 8	0 2
Green	67 3	-40 1	35 2	53 4	138 7			0.5	0 3	0 7	0 7
Yellow	90 2	10 2	72 4	73 2	98 0			0 1	0 1	0 1	0 7
Black 2	20 1	1.2	2 1	2 4	69 8			1.3	1 3	1.2	1 3
Red	60 5	40 9	26 8	46.8	27 1			0.5	0.9	0.2	0.8
Orange	59 5	38 9	31 6	48 7	40 8			0.5	0.8	0.2	0 9
Magenta	58 2	40 6	-14 3	51 7	343 9			0.5	0.8	0 2	0 5
Brown	35 8	7.9	1 0	8.0	7 4			1.0	1 1	1 0	1 1
Neutral	9.1 2	0 8	4 4	4 5	280 9			0 1	0 1	0 1	0 1
FR POLY SATIN SINGLE STRIKE											
102 LIGHT 18 MIN SPRAY - INITIAL 2 HRS											
Lavender	58.5	12.8	-28 0	29.0	266 3	4.3	-0.8	0.8	0.8	0.6	0.4
Black 1	46 8	3 2	-4.9	5 9	302 6	3 2	0.0	0.8	0.8	0.8	0 8
Blue	59 6	3 7	-25 3	23 6	279 0	4 0	-1 1	0 6	0 6	0 6	0.4
Cyan	72 1	-18 7	-29 6	35.0	237 8	2 6	-0.7	0.4	0.5	0 6	0 1
Green	75 7	-23 9	17.2	29.3	144 1	16 0	4.6	0.3	0.2	0 3	0.4

60163741.110499

Page 1

0032

6632

6ЬHOTT' ThZE9T09

POLY SATIN

Color Values											
Fabric Type	L*	a*	b*	C*ab	h*	DE	DE	V	M	C	Y
Yellow	91.7	-9.0	48.2	47.1	101.1	13.8	1.8	0.1	0.1	0.1	0.4
Black 2	42.8	1.4	0.8	1.6	31.1	4.5	-0.4	0.9	0.9	0.9	0.9
Red	64.8	51.2	12.3	33.6	21.6	3.4	-0.6	0.4	0.6	0.2	0.6
Orange	67.3	26.3	22.5	34.6	41.0	2.8	-0.2	0.4	0.6	0.2	0.6
Magenta	65.1	39.6	-13.9	42.2	340.2	2.0	-0.5	0.4	0.6	0.2	0.4
Brown	50.5	11.4	1.8	11.6	350.8	1.6	-0.3	0.7	0.6	0.6	0.7
Neutral	91.5	1.1	5.3	5.6	281.5	0.8	0.1	0.1	0.1	0.1	0.0
FR POLY SATIN DOUBLE STRIKE 102 LIGHT 18 MIN SPRAY - INITIAL 2 HRS											
Lavender	50.0	13.8	-30.6	33.6	294.2	5.1	-1.3	0.8	0.8	0.7	0.5
Black 1	34.2	2.9	-0.8	3.0	344.3	0.1	-0.3	1.1	1.1	1.1	1.1
Blue	46.9	4.8	-22.6	23.4	281.8	3.5	-0.2	0.8	0.8	0.8	0.6
Cyan	65.8	-21.5	-35.8	40.3	237.0	3.5	-1.3	0.6	0.4	0.8	0.2
Green	76.3	-29.1	14.2	32.3	154.1	25.5	11.1	0.3	0.2	0.5	0.4
Yellow	89.1	-5.1	39.6	40.8	102.8	32.7	4.8	0.1	0.1	0.1	0.4
Black 2	32.8	1.5	3.0	3.4	62.9	5.8	0.2	1.2	1.2	1.1	1.2
Red	57.2	39.0	20.6	44.1	27.8	2.1	0.5	0.5	0.8	0.2	0.8
Orange	60.1	35.2	31.0	46.9	41.4	2.0	0.5	0.5	0.8	0.2	0.9
Magenta	56.9	48.0	14.2	50.1	343.5	1.7	-0.4	0.5	0.8	0.2	0.5
Brown	38.4	7.4	0.9	7.4	6.9	2.6	-0.1	1.0	1.1	0.9	1.0
Neutral	93.6	1.1	-0.5	5.0	282.8	0.7	0.2	0.1	0.1	0.1	0.0
FR POLY SATIN SINGLE STRIKE 102 LIGHT 18 MIN SPRAY - 4 HRS											
Lavender	62.8	11.4	-23.9	26.2	295.9	9.3	-0.6	0.6	0.5	0.5	0.3
Black 1	40.1	2.9	-4.6	5.6	301.5	3.7	-0.1	0.8	0.8	0.8	0.6
Blue	62.9	3.4	-20.9	21.2	279.4	6.8	-0.8	0.5	0.5	0.6	0.3
Cyan	73.8	-17.5	-28.0	33.0	237.9	5.1	-0.8	0.4	0.3	0.6	0.1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

00236

66hOTT: Th/E9T09
POLY SATIN

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	DE	V	M	C	Y
Brown	60 3	11.5	-1 7	11 6	351 6	34 9	19.8	0 7	0 8	0 6	0 7
Neutral	94 9	1 1	-5 1	5.2	282 6	0 6	0 16	0 1	0 1	0 1	0.0
FR POLY SATIN DOUBLE STRIKE 100 LIGHT 10 MIN SPRAY 24 HRS											
Lavender	51.3	13.0	-29 9	32 6	293 5	6.8	-1 7	0 7	0 7	0 7	0.4
Black 1	34 5	2.9	-0 6	3 0	344 4	4.6	0 2	1.0	1 1	1 0	1 1
Blue	47 7	4.3	-22.2	22 6	281 0	4.2	-0.5	0 8	0 8	0 6	0 5
Cyan	70 1	18.4	-26.5	35 4	236 8	9 6	-1.4	0 5	0.3	0 7	0 1
Green	53 8	-20.6	7.6	22 0	159 8	37 3	12.5	0 2	0 1	0 3	0 2
Yellow	92 0	6.3	30.7	31 8	105 2	41.8	6.0	0 1	0 1	0 1	0 3
Black 2	27 8	1.2	2.5	2 8	62 9	1.4	0 1	1 2	1 3	1 2	1 3
Red	54 5	39 1	21.0	44 4	28 2	2 6	0.8	0 5	0 9	0 3	0 9
Orange	54.8	35 7	20.8	44 0	28 3	12 1	10.1	0 5	0 9	0 3	0.9
Magenta	58 3	48.3	14.4	50.4	343 5	2.3	-0.4	0.5	0 9	0.3	0 5
Brown	38.5	7.5	0.8	7 5	4 9	5 1	-0.3	1 0	1 0	0 9	1 0
Neutral	93 4	1 1	-4.8	4.9	283 0	0 6	0.2	0 1	0 1	0 1	0.1
FR POLY SATIN SINGLE STRIKE 102 LIGHT 10 MIN SPRAY - 0 HRS											
Lavender	93 0	11 0	-23 5	26 2	298 1	9.4	-0.84	0 5	0 5	0 5	0 3
Black 1	46.6	3 0	-4.4	5 3	304.6	4.2	0.21	0 8	0 8	0 8	0 8
Blue	63 5	2.9	-20 5	20 7	277 9	8.4	-1.42	0 6	0 6	0.5	0 3
Cyan	74.2	16.8	-27.2	32.0	238.3	6.3	-0.36	0.4	0.3	0 6	0 1
Green	65 4	16.7	11.4	20 2	145.8	28.4	4 71	0.2	0 1	0 3	0 5
Yellow	91 8	-7 5	33.1	33 9	102 8	26.6	2 69	0 1	0 1	0 1	0.3
Black 2	45.3	1.4	0 9	1.6	31 6	6.6	0.41	0.8	0 8	0 8	0 9
Red	55.2	29 7	13.1	32 5	23 9	4.6	0.88	0.4	0 6	0 2	0 6
Orange	67.6	25.7	23.0	34.2	42 2	5.6	0.54	0.4	0.6	0.2	0.6
[illegible]	66 7	36.4	-13.1	40 5	341 2	5.7	-0.21	0.4	0.6	0.2	0.6
[illegible]	50.1	11.4	-7.7	11 6	35[illegible].3						
[illegible]	39.0	11.2	-3[illegible].1	6.2	29[illegible].0						

Page 1

328

CD329

66hOTT* Th7E9T09
POLY SATIN

	Colour Values										
Fabric Type	L*	a*	b*	C*	h°	DE	DH	V	M	C	Y
Lavender	62 3	12 3	-29.3	31 7	292 6	6.2	-2.07	0 7	0 7	0 7	0 4
Black 1	35 6	2 7	-0.8	2 8	343.3	6.2	0.11	1 0	1 1	1 0	1 0
Blue	48 2	4 3	-22.5	23 0	280.8	4.4	-0.57	0 8	0 8	0.8	0 5
Red	71 2	-16.4	-27.5	33 1	236 1	12 1	-1 76	0.4	0.3	0 6	0 1
Green	65 6	-18.3	7.8	19 9	156 9	38 7	10.24	0 2	0.1	0 3	0 2
Yellow	90 2	7 3	27 2	28 2	105 1	45 3	5 88	0 1	0.1	0 1	0 3
Black 2	31 1	1 3	2 9	3 1	65 3	2 1	0 28	1.2	1.2	1 2	1 2
Pink	55 2	37 6	19 5	42 5	27 5	3 7	0 51	0 5	0 9	0 3	0 8
Orange	57 8	35.0	31 1	46 8	41 6	2.7	0 69	0.5	0 8	0.2	0 8
Magenta	56 3	47 8	14 1	49 8	343 5	2 8	-0 32	0 5	0.9	0 3	0 5
Brown	39 0	7 5	0 7	7 5	5 5	3.2	-0 26	1 0	1 0	0 9	1 0
Mustard	84 2	1 1	-5 2	5 3	282 1	1 3	0 13	0 1	0 1	0 1	0 0

POLY POPLIN

Fabric Type	Color Values											
	L*	a*	b*	C*	h°	DE	DEI	V	M	C	Y
ER POLY POPLIN SINGLE STRIKE											
Lavender	50 0	14 9	-30.4	33.9	296.0			0 8	0 8	0 7	0.8
Black 1	38 9	2 5	-6 1	6.6	292 0			1 0	1 0	1.0	0 9
Blue	49 7	5 2	-26.1	26.6	280.5			0.8	0 7	0.8	-0.8
Cyan	66 3	-21 2	-37 6	43 0	240.5			0 6	0 4	0 6	-0.1
Green	07 3	-35 3	32.0	47 6	137.8			0.4	0.3	0 6	-0.8
Yellow	89 7	-9 2	67.4	68 0	97.8			0 1	0 1	0 1	0.8
Black 2	36 0	1 2	0.7	1.4	29 0			1 1	1 1	1 1	1.1
Red	69 3	36 1	17 6	40 2	26 2			0.5	0.8	0.2	0.7
Orange	61 1	33 6	28 2	43.8	40.1			0.4	0 7	0 2	0.8
Magenta	59 5	45 7	-14.0	47 6	343 0			0 5	0 8	0.2	0.8
Brown	43 7	11 6	-2 1	11 7	349 8			0 9	0 0	0 8	0 9
Neutral	94 9	0 6	-8.2	0 2	274.8			0 1	0 1	0 1	0.0
ER POLY POPLIN DOUBLE STRIKE											
Lavender	38 3	15.9	-31.0	34 8	297.2			1.0	1 1	1.0	0.9
Black 1	27 6	2.3	-3.4	4 1	304.5			1.5	1 5	1.2	1.2
Blue	37 6	6 1	-27.0	27 7	282.6			1 1	2 0	1 1	0.9
Cyan	57 9	-21 0	-41 6	46.5	243 2			0 7	0.5	1 1	0.9
Green	60 2	-41 0	31 5	51 7	142.4			0 6	0 4	0 6	0.8
Yellow	88 0	7 7	78.8	79 2	95 6			0 1	0 1	0 1	0.8
Black 2	25 9	0 9	1.2	1 4	53.5			1.3	1 3	1 3	1.2
Red	49 9	46 9	22 2	50 9	25 8			0 6	1 0	0.3	1.0
Orange	52 8	42 9	31.4	53 1	36 2			0.8	0 9	0 3	1.0
Magenta	51 8	51 0	10 1	52 0	348 9			0 6	1 0	0 3	0.9
Brown	32 3	8 6	-0 7	8 6	355.7			1 1	1 2	1.0	1.2
Neutral	94 7	0 6	-6 1	6.1	276.3			0 1	0 1	0 1	0.0
ER POLY POPLIN SINGLE STRIKE											
[illegible]	51.0	13.6	[illegible]	52.7	[illegible]						
[illegible]	39 4	2 1	[illegible]	5.1	[illegible]						
[illegible]	26.2	1.9	[illegible]	27 1	[illegible]						
[illegible]	60	-20 7	[illegible]	39.8	[illegible]						
[illegible]	71	33.2	[illegible]	142 7	[illegible]						

Page 1

330

66hOTT' TH7E9T09

POLY POPLIN

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	DH	V	M	C	Y
Yellow	90 0	-9 2	63.8	64.4	98.2	3.8	0.6	0 1	0.1	0 1	0.8
Black 2	37 1	1.2	0 1	1 2	2 8	1.3	-0.6	1 0	1 0	1 0	1.0
Blue	60.0	34.3	17 0	38 3	26.3	2 1	0.1	0 6	0 7	0 2	0.6
Orange	81 6	32.2	21 0	42.0	33.0	1.8	-0 1	0.4	0 7	0 2	0.6
Magenta	69 9	44.5	-14 0	46.6	342 5	1.3	-0.4	0 5	0.8	0.2	0.8
Brown	44 8	11 4	-2.0	11 6	350 0	1 1	0.0	0.8	0.9	0 7	0.8
Neutral	94 9	0 6	6 6	6 6	275 4	0 4	0 1	0 1	0 1	0 1	0.0
FR POLY POPLIN DOUBLE STRIKE											
102 LIGHT 18 MIN SPRAY - INITIAL 2 HRS											
Lavender	39 4	14 7	-31 5	34 7	295 1	1 7	-1.3	1.0	1 0	1.0	0.8
Black 1	28 7	2 1	-3 4	4 0	301 6	1 1	-0.2	1 2	1 2	1.2	1.2
Blue	40 1	4 0	-25 8	26 1	278 7	3 4	-1 8	1 0	1.0	1 0	0.7
Cyan	59 3	-21.9	-38 2	44 0	240 8	2.8	-1.5	0 7	0.5	1 0	0.2
Orange	65.2	-36 7	24 8	44.3	145 9	6 4	2.9	0.5	0.2	0 7	0.6
Yellow	89 1	-8 [illegible]	70.5	71 4	96 6	7.9	1.3	0.1	0 1	0 1	0.7
Black 2	27 7	1 0	0.8	1.3	40 5	1 9	-0 5	1.2	1.2	1.2	1.2
Red	50.4	44.4	21 5	49 4	25.8	1 7	-0 1	0 6	1 0	0.3	1.0
Orange	53 5	41.0	30.5	51 1	36 6	2.2	0.3	0.5	0 9	0.3	1.0
Magenta	52 0	50.2	10 2	51 2	348 5	1 6	-0.4	0 6	1 0	0.3	0.6
Brown	33 7	8 6	-0.7	8 6	355 7	1.4	0.9	1 1	1.2	1.0	1.1
Neutral	94 6	0 6	-6 4	6.4	275 6	0.3	0 0	0.1	0.1	0 1	0.0
FR POLY POPLIN SINGLE STRIKE											
102 LIGHT 18 MIN SPRAY +4 HRS											
Lavender	51 3	13 0	-30.0	32 7	293 5	2 7	-1.5	0 7	0.8	0 7	0.4
Black 1	39 0	2 2	-6.1	6 4	289 6	0 8	-0.3	0 9	0 9	0 9	0.9
Blue	62 8	3.7	-26.9	27 1	277 8	3.7	-1.3	0.7	0 7	0 7	0.4
Cyan	66.9	-20 6	-33.5	39 3	238.8	5.4	-1.8	0.6	0 3	0 7	0.0
[illegible]	72.4	-33.0	26.5	41.9	141.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] Page 2

POLY POPLIN

Fabric Type	Color Values L*	a*	b*	C*	h*	DR	DH	V	M	C	Y
Brown	45 3	11.4	-2.1	11 6	349 6	1 1	-0.1	0.8	0.9	0 7	0.8
Neutral	64 7	0.8	-6.8	6.8	276 8	0 6	0.1	0 1	0.1	0 1	0.0
FR POLY POPLIN DOUBLE STRIKE											
103 LIGHT 15 MIN SPRAY - 4 HRS											
Lavendor	39 9	14.4	-31.6	34 7	294 4	2.5	-1 7	1 0	1.0	1.0	0.6
Black 1	28 5	2 0	-3 1	3 7	302 7	0 6	-0 1	1.2	1 2	1 2	1.1
Blue	41 5	3 6	-28.1	28.3	277 5	4 7	-2.3	1.0	0 9	1 0	0.6
Cyan	60 2	-21 9	-35 6	44 4	240 4	3 6	-2 2	0 7	0 6	1.0	0.3
Green	66 6	-35 7	24 6	43 3	145 5	11.0	2 5	0 5	0.3	0 6	0.6
Yellow	89 3	-8 5	97 3	97 8	97.2	11 8	2 1	0 1	0 1	0 1	0.0
Black 2	27 8	1 0	0 7	1 2	37.3	1 6	-0.4	1 3	1 3	1.3	1.3
Red	50 7	43 3	20 9	48 1	25 8	3.0	-0 1	0 6	1.0	0 3	1.0
Orange	53.7	40 4	30.0	50.3	36.6	3.0	0.3	0 5	0.9	0.5	1.0
Magenta	52 4	49 3	-10 0	50.5	348.5	2.4	-0.4	0.8	1 0	0.3	0.8
Brown	34 3	8 6	-0.8	8 6	354 5	1 2 1	-0.2	1 1	1 1	1 0	1.1
Neutral	64 3	1 0 7	-6.4	6.5	276 9	0 6	0 1	0 1	0.1	0.1	0.0
FR POLY POPLIN SINGLE STRIKE											
103 LIGHT 15 MIN SPRAY - 6 HRS											
Lavendor	57 3	13 0	-30 0	32 7	293.5	3.4	-1.5	0 7	0.7	0 7	0.4
Black 1	39 7	2 1	-6 1	6.5	288.2	0.9	-0.3	0.9	0 9	0 9	0.5
Blue	53 6	3 0	-28 5	28.6	276.4	4.8	-2.0	0 7	0.7	0.7	0.5
Cyan	70 1	-20 7	-32 7	38 7	237.8	6.1	-2 0	0.5	0.3	0 7	0.3
Green	72 8	-32 5	25.9	41.6	141 6	7.8	2.8	0.4	0.2	0 5	0.6
Yellow	90 6	-9 7	56.5	57.3	96.7	11 0	2.1	0 1	0 1	0.1	0.6
Black 2	37 4	1 3	-0 1	1 3	357.8	1 7	-0 7	1.0	1.0	1.0	1.0
Red	60 6	32 9	16.9	37 0	27.1	3.5	0 6	0.6	0 7	0.2	0.7
Orange	61.8	31 4	27.0	41.4	40.6	4.6	0.4	0.4	0 7	0.2	0.7
Magenta	60.0	43 6	-15.6	46.7	342.1	4.2	-1.1	0.6	0.9	0.4	0.8
Brown	45 2	11 2	-2.0	11.4	350.1	1 1	-0.1	0.8	0.9	0 7	0.8
Neutral	64 7	0 7	-6.8	6.8	276.8	0 6	0.1	0 1	0.1	0 1	0.0

66HOTT' TH7E9TO9

POLY POPLIN

	Color Values										
Fabric Type	l*	a*	b*	C*	h*	DE	DH	V	M	C	Y
Lavender		14.0	-31.8	34.8	294.0	2.9	-1.9	1.0	1.8	0.9	[illegible]
Black 1	29.0	1.7	-3.3	3.7	297.7	1.8	-0.4	1.2	1.2	1.2	[illegible]
Blue	42.3	3.2	-35.7	35.9	277.1	5.7	-2.8	1.0	0.9	1.0	[illegible]
Cyan	60.6	-22.1	-38.5	44.3	240.2	4.2	-2.4	0.7	0.5	1.0	204
Green	67.1	-35.8	24.6	43.4	145.5	11.1	2.5	0.6	0.3	0.6	0.8
Yellow	89.7	-9.0	84.4	85.0	97.6	14.5	2.9	0.1	0.1	0.1	0.8
Black 2	28.2	1.0	0.6	1.2	29.4	2.3	-0.5	1.3	1.3	1.3	1.3
Red	50.8	42.9	20.9	47.8	26.0	3.3	0.1	0.6	1.0	0.3	1.0
Orange	53.9	40.0	29.8	49.9	36.7	3.6	0.4	0.5	0.9	0.3	1.0
Magenta	52.3	49.1	-10.0	50.1	348.5	2.6	-0.4	0.6	1.0	0.3	0.8
Brown	33.6	8.5	0.6	8.6	355.7	1.3	0.0	1.1	1.1	1.0	1.3
Neutral	94.1	0.8	-8.4	8.4	277.2	0.7	0.2	0.1	0.1	0.1	0.0

Page 1

66hOTT' Th7E9TO9

250 DACRON

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	DH	V	M	C	Y
FR POLY 250 DACRON SINGLE STRIKE											
Lavender	46.4	18 6	-35 1	39.8	298 3			0.8	0 8	0.8	0.4
Black 1	35 8	2.5	-4 8	5 4	297 2			1 1	1 1	1.0	1.0
Blue	47 5	6 0	-28.8	29 2	278 9			0.8	0 8	0 9	0 8
Cyan	68.0	-21 6	-36.3	42 9	240 7			0.6	0.4	0 8	0.1
Green	66.2	-38.8	28.8	48 0	143 4			0 4	0 3	0 8	0.6
Yellow	69 1	10 9	60.3	61.3	100 2			0.1	0 1	0 1	0.6
Black 2	32.6	1 2	1 1	1.6	41.4			1 1	1 1	1 1	1 2
Red	55.4	37 7	15 6	40 9	22 7			0 5	0 8	0 2	0 7
Orange	61 1	32.0	26.2	41.4	39 2			0.4	0 7	0.2	0.8
Magenta	56 7	46 6	-16 9	49 6	339 6			0 5	0.8	0.2	0.4
Brown	42 0	9 8	2.4	10 1	346 3			0 0	1 0	0.8	0.9
Neutral	93.4	1.0	-8 7	8.7	270 6			0 1	0 1	0.1	0.5
FR POLY 250 DACRON DOUBLE STRIKE											
Lavender	42.9	17 9	-36 0	40 2	296.4			0 9	1 0	0 9	0.5
Black 1	27.9	2.8	-2 6	3.7	318 6			1 3	1.3	1.3	1.3
Blue	41.0	6 1	-27.4	28.0	282.5			1 0	0.9	1.0	0.8
Cyan	62 1	-22 2	-40 1	45.9	241 0			0.7	0.4	1.0	1.2
Green	64 7	-41 5	35 8	54 7	139 1			0.6	0.5	0 7	0.7
Yellow	87.0	10 7	71.4	72.2	98 5			0.1	0.1	0 1	0.7
Black 2	25.8	0 8	1 8	2.0	66.8			1 3	1.3	1.3	1.4
Red	53.4	41 0	22 2	46 7	28 6			0.8	0 9	0.3	0.9
Orange	56 9	36 8	33 2	49 6	42 1			0 6	0.8	0.2	0.9
Magenta	55.8	49 8	-15 8	52.3	342 5			0.5	0 9	0.3	0 5
Ryolin	34 2	5 1	-0 3	5 2	357 8			1 1	1 2	1.0	1 3
Neutral	93 2	1 1	-8 5	8 6	277 5			0 1	0 1	0 1	0.0
FR 250 DACRON SINGLE STRIKE											
[illegible]	61 1	12 6	[illegible]	15 4							
[illegible]	57.4	20 1	[illegible]	18 3							
[illegible]	50 0	31 0	[illegible]	22 3							
[illegible]	56 8	16 8	[illegible]	17 0							
[illegible]	75.3	2 8	[illegible]	34 0							

Page 1

250 DACRON

324

Fabric Type	Colour Values L*	a*	b*	C*	h°	DR	DI	V	M	C	Y
Yellow	89.4	9 9	42 9	44 0	103 1	17.5	2.8	0 1	0 1	0.1	0.4
Black 2	37 0	1 1	0.8	1 4	34 3	4.3	-0.2	1.0	1 0	1 0	1.0
Red	59 0	38.3	18.2	39.3	22 7	1 7	0.0	0.5	0.8	0 2	0.0
Orange	61 5	31 1	25.5	40.4	39 8	1.4	0.4	0.4	0 7	0.2	0.5
Magenta	60.4	43.8	-16 2	46 7	339 7	2.0	0 1	0.8	0 7	0.2	0.1
Brown	45.2	9 4	-2 1	9 6	347.8	1.3	0.2	0.9	0.9	0.8	0.9
Neutral	83 4	1 4	-8 4	8 5	279.2	0.4	0.4	0 1	0 1	0 1	0.0
FR 250 DACRON DOUBLE STRIKE											
102 LIGHT 18 MIN SPRAY - INITIAL 2 HRS											
Lavender	45 8	15.4	-34 2	37 5	294 3	4 2	-1.5	0 9	0 9	0.8	0.5
Black 1	30 0	2 4	-2 5	3.4	313 6	2 1	-0.3	1.2	1 2	1.2	1.2
Blue	44 5	4 2	-24 8	25 1	279 6	4.8	-1.3	0 8	0 8	0 8	0.8
Cyan	63 5	22 2	-37 5	43 5	239 4	3.0	1.3	0.6	0 4	0 9	0.2
Green	70 6	-34 5	21 4	40 6	148 2	17.0	7.5	0.4	0 3	0 6	0.6
Yellow	88 0	-10 5	51 1	52 1	101 6	20.4	3.5	0 1	0 1	0 1	0.6
Black 2	29.7	0.8	1 7	1 9	65.6	4 1	0.0	1.2	1.2	1 2	1.3
Red	54 2	39 5	21 7	45 0	28.8	1.8	0.2	0.5	0.8	0.3	0.8
Orange	67 2	35 8	32.4	48.4	42 1	1.3	0.0	0.5	0.8	0 2	0.8
Magenta	58 1	48 9	15.2	51 2	342.8	1 1	0 3	0.5	0 8	0 3	0.5
Brown	34 8	8.2	-0 3	8 2	358.2	0.8	0.1	1 1	1 1	1.0	1.1
Neutral	82 8	1 1	-7 5	7 6	278.6	1 1	0.2	0 1	0 1	0.1	0.0
FR 250 DACRON SINGLE STRIKE											
102 LIGHT 18 MIN SPRAY - 4 HRS											
Lavender	53 7	13 2	-31 9	34 5	292.5	7 1	-1.8	0 7	0 7	0 7	0.4
Black 1	35 0	2.4	-4 5	6.1	298 5	2.2	0 1	1.0	1.0	1 0	0.9
Blue	52 9	3 7	-24 9	25.1	278 4	6.8	-0 7	0.7	0 7	0 6	0.4
Cyan	72 0	-18 6	-31.3	36.4	239.3	9.7	-0.9	0.4	0.3	0.6	0.1
Green	77.3	-26.8	12.8	29.7	154.1	21.1	7.5	0.3	0.7	0.4	0.1

00385

66;hOTT" Th/E9T09

250 DACRON

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	DH	V	M	C	Y
Brown	44 9	9 7	1.5	9.8	361 3	3.1	0.9	0.8	0 9	0 7	0.8
Neutral	83 8	1 2	7 4	7 5	279.4	1.4	0.4	0.1	0 1	0 1	0.0
FR 250 DACRON DOUBLE STRIKE											
1tz LIGHT 18 MIN SPRAY - 4 HRS											
Lavendor	40 6	14 3	-33 3	36 2	293.3	5.8	-2 1	0.5	0 9	0 8	0.5
Black 1	30 9	2.5	-2 5	3 6	315.1	2 9	-0.2	1.2	1.2	1 1	1.1
Blue	48.2	3 1	-23 1	23 3	277.8	8.8	-2.2	0.8	0 7	0.8	0.8
Cyan	65 6	-21.6	-35 1	41 1	238 5	6.1	-1.8	0.6	0 4	0 6	0.2
Green	72 7	-31.0	16.5	35 2	151.8	23 1	9 6	0 4	0 3	0 5	0.5
Yellow	87 9	-9.6	47.2	48 2	101 5	24.2	3 1	0 1	0 1	0 1	0.5
Black 2	32 8	1.2	2 2	2 5	61 8	7.2	-0 2	1 1	1 1	1 1	1.2
Red	55 6	36 2	21 1	43 8	29 0	3 8	0.3	0 5	0 9	0 3	0.8
Orange	58 8	34.5	31.2	46 6	42 1	3.6	0.1	0.5	0 6	0 2	0.8
Magenta	56 1	46.8	-16 2	51 2	342.8	1 1	0 3	0.5	0 8	0.2	0.5
Brown	37 1	8.4	0 1	8 4	0.6	2 9	0.4	1.0	1 1	0.9	1.0
Neutral	83.8	1.4	7 1	7 2	280 1	1 5	0 5	0 1	0 1	0.1	0.0
FR 250 DACRON SINGLE STRIKE											
102 LIGHT 18 MIN SPRAY - 8 HRS											
Lavendor	50 0	11 9	-30 0	32 3	291 8	12 7	5.3	0 6	0 8	0 6	0.3
Black 1	38 5	2.3	-4 4	5 0	296.0	2.7	0 1	1.0	1 0	1.0	0.9
Blue	48 8	3 0	-22 5	22 7	277 5	13.1	-1 1	0 6	0 5	0 6	0.4
Cyan	73 4	-17 9	-29 6	34 6	235 9	11 9	-1 2	0.4	0 3	0 6	0.1
Green	78.2	-25 5	12 2	28 3	154.4	22.9	7 1	0.3	0.2	0 4	0.4
Yellow	89 0	-9 4	38 9	40.0	103 6	21 5	2 9	0 1	0 1	0 1	0.4
Black 2	39.2	1.4	1 5	2.0	47.4	8.6	0.2	0.9	1.0	0.9	1.0
Red	60 3	34 7	18.5	39 1	24.4	3.9	1.2	0.5	0 7	0 2	0.7
Orange	63.1	28 4	25 6	39.0	41.6	3.3	1.3	0.4	0.6	0.2	0.6
Magenta	62.0	42 2	-14.6	44.6	340.6	2.7	1 1	0.4	0 7	0.2	0.6
Brown	45.0	9.6	51.4	9 7	3						
Neutral	84.3	1.2	7.0	7 1	8						
FR 250 DACRON DOUBLE STRIKE											
102 LIGHT 18 MIN SPRAY - 8 HRS											

336

66h0TT' Th7E9T09

260 DACRON

	Color Values										
Fabric Type	l*	a*	b*	C*	h*	DK	DH	V	M	C	Y
Lavender	48 0	13 2	-32 1	34 7	292.4	6.8	-2.8	0.8	0 8	0.7	0.4
Black 1	33 3	2.3	2 2	3 1	316.0	6.4	-0.2	1.0	1 0	-1 0	-1.0
Blue	52.4	2 5	-21.2	21 4	276.7	13.4	-2.6	0 7	0.7	0 7	0.6
Cyan	67 5	-25 8	-33.3	39.2	238 0	8 7	-2.2	0 6	0.4	0 6	0.3
Green	74 0	-29 2	15 5	33 1	152 1	26.4	9 7	0.4	0 3	0 6	0.2
Yellow	88 0	-9 3	43.9	44 9	102 0	27 6	5.4	0 1	0 1	0 1	0.0
Black 2	32 6	1 2	2 4	2 7	63 3	7.0	-0 1	1 1	1 1	1 1	1.2
Red	56 0	37 3	20.8	42 7	29 2	4.8	0 5	0.8	0 8	0 3	0.8
Orange	66.0	34 1	31.2	46 2	42 4	4 1	0 3	0 8	0 8	0.2	0.9
Magenta	57 5	46 9	-14 0	48 9	343.4	4 1	0.8	0 5	0.8	0.3	0.6
Brown	37 1	8 2	0 3	8 2	2 0	3.0	0 8	1 0	1 1	0 9	1.0
Neutral	93 4	1 3	-6.8	6.9	280 9	1 7	0 5	0 1	0 1	0.1	0.0

60787

Standard Test Method: PT-0004

Kimberly-C
Printing Technology Busi

STANDARD TEST METHOD FOR MEASURING COLOR OF DIGITAL PRINTS WITH THE CIE SYSTEM

1 Scope

1.1 This test method specifies the procedure for measuring the color of d prints using the CIE System.

1.2 The sample preparation equipment needed and measurement techniques are outlined in this STM

2 Significance and Use

2.1 The sign industry is totally dependent on color reproduction and management. CIE provides objective information on color matches or visually perceived appearance. These values also allow for computation of color differences

3 Terminology

3.1 Achromatic Color: a neutral color (white gray, black) that has no hue

3.2 Chromatic: perceived as having a hue not white gray or black.

3.3 Chromatic Attributes. those attributes associated with the spectral distribution of light: hue and saturation

3.4 CIE, Commission Internationale de l'Eclairage: translated as the International Commission on Illumination, the main international organization concerned with color and color measurement.

3.5 CIE Chromaticity Coordinates the ratios of each of the tristimulus values of a color to the sum of the tristimulus values. These are designated x, y and z.

3.6 CIE 1976 L*a*b* Color Space: a uniform color space utilizing the Ad Nickerson cube root formulas, adopted by the CIE in 1976 for use in measurement of small color differences.

3.7 CIE Standard Observer: a hypothetical observer having the tristimu color mixture data recommended in 1931 by the CIE for a 2° field o vision. A supplementary observer for a larger 10° was adopted in 197

5016374.1104799

3.8 L* - lightness-darkness (0 = black, 100 = white)

3.9 a* - red (+) green (-) axis

3.10 b* - yellow (+) / blue (-) axis

3.11 ΔE* - The vector difference in CIE color space between two objects under specified conditions $\Delta E^* = [(L^*_{std}-L^*_{std})^2+(a^*_{std}-a^*_{std})^2+(b^*_{std}-b^*_{std})^2]^{1/2}$

3.12 ΔH* - the 1976 a b true difference $\Delta H^* = [a^*_{std}-a^*_{std})^2+(b^*_{std}-b^*_{std})^2]^{1/2}$

3.13 Tristumulus Values - the amounts of three reference or matching stimuli required to give a match with the color stimulus considered in a trichromatic system

3.14 Density Optical - the ability of material to absorb light; the darker it is, higher the density

3.15 Hue - the attribute of color perception by means of which an object is judged to be red, blue, green, purple, etc.

3.16 Illuminant: incident luminous energy specified by its spectral distribution

3.17 Light: electromagnetic radiation in the spectral range detectable by the human eye (approx. 350 to 780)

3.18 Lightness: perception by which the white objects are distinguished from gray objects and light from dark-colored objects

3.19 Light Source: the element in an instrument or in the visual observing situation that furnishes light.

3.20 Saturation: the attribute of color perception that expresses the degree of departure from the gray of the same lightness

3.21 Standard: a reference against which instrumental measurements are made.

4 Apparatus.

60156374.1101499

Standard Test Method: PT-0004

Printing Technology Busi

– 1 Hunter MiniScan XE
Spectrodensitometer
spectrodensitometer wit a
8° integrating sphere reflectance specular included in accordance wi
ASTM D 1221–93 and SATM E308-90 The specimen port is circ
and is 1 25 inch diameter with an 8° viewing angle and a beam diam
of 1 00 inch This instrument is capable of computing color data in CI

color space using spectral data taken every 10 nm over the wavelen
range from 400 nm to 700 nm.

5 Apparatus Setup

5 1 This STM utilizes the Hunter MiniScan XE Spectrodensitometer

5.2 Settings

5 2 1	Standard Observer	field of view was used in evaluating the color response functions of actual observers.
5 2 2	Standard Illuminant	D50 - illuminant for daylight.
5.2 3	Color Space	CIE 1976 L*a*b* and ΔE* values.

6 Test Procedure

6 1 Sampling Procedure

6 1 1 Samples are printed in accordance to STM PT-2010 with 1" x 2" color blocks of the primary colors (C M Y K) the secondary colors (R G B) and an unprinted block (W)

6 2 Testing Protocol.

6.2.1 Measurements are taken of each color 24 hours after they are printed. These measurements (L^*_{24}, a^*_{24}, b^*_{24}) are the standard (0 time) colors to which later measurements will be compared. All samples will be measured three times and averaged for each sample. These standards then can be used to quantify color gamut, brightness and other image quality tests time 0 that might be desired.

6.2.2 For color difference measurements ΔE* is calculated by comparing the standard (L^*_{24}, a^*_{24}, b^*_{24}) against the sample

5015374.1 110499

Kimberly-Clark
Testing Technology Bu

after testing has been
performed
grip strength, wet strength, etc. These samples will be
measured the same as 6.2.

5016374.1107699

Standard Test Method: PT-0004

Kimberly-C
Printing Technology Bu

- Report

  - Data should be reported for each primary and secondary color as sh
    in Table 1

  - Data for color difference calculations should be reported for each prim
    and secondary color as shown in Table 2.

  - Generally the standard deviation among separate readings of the
    sample should not exceed 0.05 ΔE^* units. Significantly greater stand
    deviation indicates either 1) operator error or 2) instrument failure.

Table 1 Data Sheet for Reporting CIE Color Information

Method	PT-0004	Color	L*	a*	b*
Date	5/19/98	Cyan			
Analyst:	ASB	Magenta			
Sample	C-9149	Yellow			
		Black			
		Red			
		Green			
		Blue			
		White			

5015374.1 10h99

Standard Test Method: PT-0004

Kimberly-C
Printing Technology Bu

Table 2. Data Sheet for Reporting CIE Color Difference

Method	PT-0004	Color	L*samp	a*samp	b*samp	Delta
Date	5.19.98	Cyan				
Analyst	ASB	Magenta				
Sample	C-9149	Yellow				
		Black				
		Red				
		Green				
		Blue				
		White				

Color	L*std	a*std	b*std
Cyan			
Magenta			
Yellow			
Black			
Red			
Green			
Blue			
White			

60163744.110499

343

Designation G 26 – 96

[illegible] may be protected by copyright law [illegible]

Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) [illegible] and Without Water for Exposure of Nonmetallic Mat[illegible]

This standard is issued under the fixed designation G 26; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense. [illegible] Department of Defense.

Scope

This practice covers the basic principles and operating procedure for water- or light-exposure apparatus, or both, employing a xenon-arc light source.

NOTE—This practice combines the practices previously referred to [illegible] G 27, Practice G 27 for [illegible] Light Exposure of Nonmetallic Materials, [illegible] it is now covered [illegible] Test Methods C and D.

2 This practice does not specify the exposure conditions best suited for the material to be tested, but is limited to the method of obtaining, measuring, and controlling the conditions and procedures of the exposure. Sample preparation, test conditions, and evaluation of results are covered in ASTM methods or specifications for specific materials.

3 This practice includes four test methods:

3.1 *Test Method 1*—Continuous exposure to light and intermittent exposure to water spray.

3.2 *Test Method 2*—Alternate exposure to light and darkness and intermittent exposure to water spray.

3.3 *Test Method 3*—Continuous exposure to light without water spray. Exposure conditions are characteristic [of] those specified by AATCC Test Method 16E 1976.

3.4 *Test Method 4*—Alternate exposure to light and darkness without water spray. Exposure conditions characteristic of those natural conditions experienced when exposing are in accordance with Practice G 24.

4 The values stated in SI units are to be regarded as the standard. The inch-pound equivalents of the SI units may be approximate.

5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 859 Test Methods for Silica in Water[2]

D 1293 Test Methods for [illegible]

D 4517 Test Method for Low[illegible] High Purity Water by Flameless [illegible]

E 691 Practice for Conducting [illegible] Study to Determine the Precision of a Te[illegible]

G 24 Practice for Conducting [illegible] Exposures Under Glass[3]

2.2 *AATCC Standard:*

Method 16 Colorfastness to Light[4]

2.3 *CIE Standard:*

No. 85 Recommendations for the Integrated Irradiance and the Spectral Distribution of Simulated Solar Radiation for Testing Purposes[5]

2.4 *ISO Standard:*

Gray Scale[5]

3. Significance and Use

3.1 Several types of apparatus with different exposure conditions are available for use. No [illegible] operating procedure for light-exposure apparatus with [illegible] water can be specified as a direct simulation of [illegible]. This practice does not imply expressly or o[illegible] weathering test.

3.2 Since the natural environment [illegible] respect to time, geography and topography it may [illegible] that the effects of natural exposure will vary [illegible] materials are not affected equally by the [illegible] environment. Results obtained by use of this [illegible] be represented as equivalent to those o[illegible] weathering test until the degree of quantitative [illegible] been established for the material in questi[illegible]

3.3 Variations in results may [illegible] instruments of different types or within [illegible] similar type instruments vary [illegible] this practice. Therefore, no [illegible] to results from use of this practice, u[illegible] the report form shown in Fig. 1 or utili[illegible] in a referenced procedure.

[1] This practice is under the jurisdiction of ASTM Committee G-3 on Durability of Nonmetallic Materials and is the direct responsibility of Subcommittee G03.03 on Simulated and Controlled Exposure Tests.

Current edition approved [illegible] 1996. Published April 1996. Originally published as E 239 – 64 T. Redesignated G 26 in 1970. Last previous edition [illegible]

[illegible]

[2] *Annual Book of ASTM Standards*, Vol 11.02.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 06.01.

[5] Available from The Secretary, American Association [illegible], P.O. Box 12215, Research Triangle [illegible]

[illegible] Available from Secretary, [illegible] of Standards and [illegible]

[illegible]

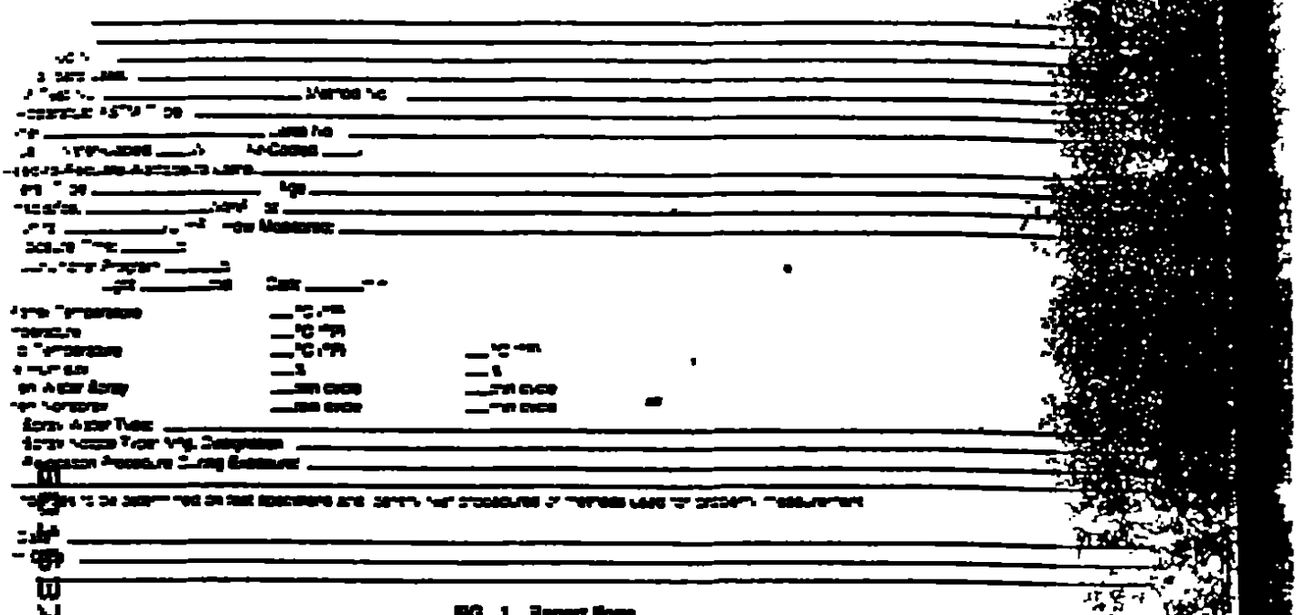


FIG. 1 Report Form

4.1.2 The xenon-arcs employed shall be of the [illegible] water-cooled type operated through suitable reactance formers and electronic equipment from a 50 or 60-Hz power supply. They shall employ cylindrical inner and outer optical filters to direct the flow of cooling water and to provide a designed spectral energy distribution.

4.1.2.1 For the purpose of this practice, the xenon-arc lamp shall consist of a quartz xenon burner tube and one of the following optical filter combinations as recommended by the manufacturer:

(a) Borosilicate glass inner and outer optical filters to simulate the spectral power distribution (SPD) of natural daylight throughout the actinic region.

(b) Infrared absorbing glass inner optical filter with outer optical filter to simulate the SPD of natural [illegible] 300 to 1000 nm.

(c) Borosilicate glass inner optical filter with [illegible] glass outer optical filter to simulate the SPD of daylight (actinic wavelengths) filtered through win[illegible]

(d) Infrared absorbing glass inner and outer [illegible] to simulate the SPD of natural daylight, 310 nm [illegible] filtered through window glass.

(e) Quartz inner and outer optical filter to [illegible] sunlight, interrupted-unfiltered by the earth's atmo[illegible]

4.1.2.2 To provide loss in levels of irradiance excessive polymerization, and to prevent [illegible] caused by exposed to optical filters exposed to [illegible] UV energy, inner optical filters shall be replaced [illegible] Suggested intervals are 300 and 400 h for Types [illegible] respectively. The outer optical filter shall be re[illegible] 1500 and 2000 h for Types A and B, respectively.

4.1.3 Distilled or deionized water shall be [illegible] must be supplied at a flow rate sufficient to [illegible]

...mination of the quartz envelope of the ... A heat-exchange unit should be used to cool the ... water.

... Since xenon-arc lamps, like all gas discharge lamps, ... a progressive drop in radiation output with ... use and since optical filters will change in their ... characteristics, provision shall be made in the ... automatically or manually for progressively increasing the voltage of the lamp to maintain changes in the intensity of the radiation at the face of the sample. The greatest change in both the xenon burner tube and optical filters occurs in the first 20 h of use. For this reason, burners and optical filters preaged by the instrument manufacturer are recommended for critical testing when a more rapidly changing rate of intensity is undesirable. For routine testing on a comparative basis, the 20 h of preaging may be omitted.

4.1.5 Many nonmetallic materials are selectively absorbing. The energy that a molecule absorbs depends upon the wavelength of the incident radiation. It is desirable to monitor the level of irradiance of the photochemically effective wavelengths if interlaboratories are to be made among samples not exposed simultaneously. Samples may then be exposed to known amounts of irradiation, the time integral of irradiance.

4.1.5.1 Where radiometers capable of monitoring discrete portions of a continuous spectrum are available, exposure to a mutually agreed-upon level of irradiation may be specified as the exposure interval in place of a time interval.

(a) When using the optical filter combination described in 4.1.3.1 (a), the suggested minimum spectral irradiance levels are

.2 W/m²/nm band at 320 nm
.35 W/m²/nm band at 340 nm
.5 W/m²/nm band at 380 nm
.75 W/m²/nm band at 420 nm

(b) When using the optical filter combination described in 4.1.3.1 (b), the suggested minimum spectral irradiance levels are

.2 W/m²/nm band at 340 nm
.45 W/m²/nm band at 380 nm
.7 W/m²/nm band at 420 nm

(c) Operating at the suggested minimum levels approximates the average daily solar irradiance under ideal conditions. It is about half of the maximum values for total irradiance on a horizontal plane when the sun is at 90° altitude as reported in CIE No. 20. When irradiance is monitored and periodic manual adjustment of voltage is made to compensate for changes of intensity, no lamp assembly should be used that cannot maintain the minimum level of irradiance within ±10 % tolerance at the monitored wavelength. Irradiation expressed as joules per square metre, is the product of irradiance × exposure time in seconds.

4.1.5.2 Xenon-arc type equipment not having a radiometer shall be operated with periodic increases in wattage to maximize any drift in levels of irradiation. Such intervals shall be established by the parties concerned or follow the suggested schedule below in 4.1.5.2 (a).

Note 2—The use of suggested wattage ... maximize and be maximum at least equal ... Area receiving a light source. This ... maximize the reduction of UV intensity with ... been using either Test Method A or C ... specimen.

(a) The following are the suggested ... each exposure interval of a 2500-W ... upon the average performance of ... borosilicate filters:

Time, h	
0 to 20	
20 to 200	
200 to 400	
400 to 600	
600 to 800	
800 to 1000	
1000 to 1200	
1200 to 1500	

(b) The following are the suggested ... for each exposure interval of a 6500-W xenon burner tube, based upon the performance of xenon burner tubes with borosilicate filters in Test Method A:

Time, h	
0 to 20	
20 to 100	
100 to 250	
250 to 400	
400 to 550	
550 to 700	
700 to 850	
850 to 1000	

(c) The following are the suggested ... for each exposure interval of a 6500-W xenon burner tube, based upon the average performance of xenon burner tubes with borosilicate filters in Test Method A:

Time, h	
0 to 20	
20 to 100	
100 to 200	
200 to 300	
300 to 1000	
1000 to 1500	
1500 to 2000	
2000 and over	

4.1.6 Specimens should be mounted ... about the lamp at a distance such that ... each specimen assures that the irradiance ... does not vary by more than 5 % ... illuminated area (not counting any ...

4.1.7 Any apparatus that ... the condition of 4.1.6 shall not be ... exceeding 10 % of the average ... recirculation during exposure ... procedure in order to minimize ... exposure.

4.1.8 Testing temperatures should be ... regulated on the basis of a black ... unit mounted on the specimen racks ... is the same relative position and ... indistinguishable from specimens ... unit should consist of ...

ASTM G154-00a

...s thermometer should have a stem approx... ...mm) in diameter with a 44.5-mm ... ...The sensitive portion extending about 2 mm ... from the end of the stem should be located in the ... in the panel approximately 64 mm (2.5 in.) from the ... approximately 38 mm (1.5 in.) from the bottom ... frame. The face of the panel with the thermometer ... should be finished with a baked-on black ... scattering coating having good resistance to ...

... A thermocouple or resistance bulb thermometer ... on the center face of the black panel, which ... temperature values equivalent to the dry thermom... may be substituted.

... A blower unit in the base of the apparatus should ... a flow of air through the test chamber and over the ... element. Control of specimen and black-panel temper... is accomplished by thermostatic control of the ... of the constant volume of air from the blower. ... temperatures should be read through the ... or by the test manager door without opening the door.

... Apparatus operated as a light- and water-exposure ... is equipped with a specimen spray unit as illus... Figs. 3 and 4. All components of the specimen spray ... should be fabricated from stainless steel, plastic, or other ... that does not contaminate the water. Apparatus oper... as a light-exposure test are not required to have the ... spray unit or, if present, it should not be used.

... Types A, AH, BH, and some Type B apparatus are ... with an electrically operated vaporizing unit for ... moisture to the air as it passes through the condi... chamber in the base section prior to its entry into the ... of the apparatus.

... In Types A and B, the vaporizing unit, when ... turned on, may operate continuously while the ... is in operation. Type A and some Type B ... may be programmed to operate the vaporizer ... a dark cycle only. The temperature of the water, with ... the vaporizer is supplied, is not controlled. In Type B ... not supplied with a vaporizing unit, the relative ... humidity within the test chamber is governed by evaporation ... water in the bottom of the chamber and from water ... through the specimen spray unit.

... In Types AH and BH apparatus, operation of the ... vaporizer is controlled automatically by a wet-bulb thermo... The temperature of the water supplied to the vaporizer ... is controlled automatically by thermostatically-actuated elec... immersion heaters. Control automatically shifts between ... separate sets of thermostats as the arc lamp is turned on ... off by the program control unit.

... In Types A, B, AH, and BH apparatus containing ... vaporizing unit, relative humidity is determined from wet- ... dry-bulb thermometers located in the air stream at the ... blower's point of exit from the test chamber.

... Determine the relative humidity for Type B ... apparatus not equipped with a vaporizing unit from wet- and ... dry-bulb thermometers mounted in holders on the specimen ... so that their sensitive portions are in the same relative ... position as the face of the test specimen but shielded from ... radiation.

... For apparatus which ... [illegible] ... Laboratory ... [illegible] ... with provisions ...

... essentially the same conditions of relative hum... produced in Type B apparatus without a vapor...

... The apparatus shall include means for ... the following:

... Wattage of the xenon-arc lamp,

... Irradiance at the specimen rack,

... Black-panel temperature,

... Dry-bulb temperature (test chamber),

... Wet-bulb temperature (test chamber),

... Exposure interval, and

... Water spray pressure when applicable.

... Where specified, the apparatus shall ... for regulating or controlling the following:

... Wattage of the xenon lamp,

... Irradiance or irradiation, or both, ... men rack,

... Temperature (test chamber),

... Relative humidity (test chamber),

... Light-dark-spray-humidity-temper... ...ne

... Water spray pressure when ...

Air-Cooled Type

... The apparatus employed shall use an ... xenon-arc lamp as the source of radiation and ... of the following types, or their equivalents:

... *Type C*—Air-cooled xenon-arc appa... W, 158-mm (6.2-in.) diameter specimen rack ... matic programming of cycles and humidity. T... rack should rotate at 5.2 ± 0.1 rpm.

... *Type D*—Air-cooled xenon-arc appa... W, 360-mm (14.2-in.) diameter specimen rack ... matic programming of temperature, cycles, and ... The specimen rack should rotate at 3.7 ± 0.1 rpm.

... *Type E*—Air-cooled xenon-arc appa... lamps operating simultaneously at 4500 W ... (24.1-in.) diameter specimen rack, with automa... ming of temperature, cycles, and humidity. T... rack should rotate at 2.0 ± 0.1 rpm.

... The xenon arcs employed in Types C and ... be of the medium-pressure, air-cooled type and ... optical filters shall be fitted between the light so... sampler to filter out unwanted wavelengths of ... combination of optical filters recommended by ... turer shall be used to simulate (*1*) sunlight in ... sunlight behind window glass, or (*3*) any ... solar irradiation condition desired.

... All gas discharge lamps have a prog... radiant output with continued use. For Type ... recommended to exchange the IR-optical fil... after 3500 h of use. Answering the purpose ... IR-optical filters of the filter burners should ... the same time but each should be exchanged ... running for 3500 h. For Type E which has th... lamp should be replaced every 500 h to minim... drop in radiant output. For Type E, the three p... filters should be cleaned monthly and repla... years of normal usage.



FIG. 2 Three-Panel Specimen Rack

4.2.4 Specimen holders should rotate around the arc, describing a cylindrical surface, so that specimens may face, or be turned opposite to, the arc. No part of the specimens shall be above or below the ends of the arc. Repositioning of specimens in upper, center, or lower positions can improve the uniformity of intensity of the exposure.

4.2.5 Testing temperatures should be measured and regulated on the basis of a black-panel thermometer unit that is mounted so that the face of the unit is in the same relative position and is subjected to the same influences as the test specimens. The black-panel thermometer unit should consist of a stainless steel plate approximately 48 by 200 by 1 mm, 1.9 by 8.0 by 0.04 in., to which a stainless steel bimetallic dial-type thermometer is mechanically fastened. The temperature at the center of the panel should be sensed by the thermometer. The face of the panel should be finished with a baked-on black glossy enamel having good stability to light.

4.2.6 A blower unit in the base of the apparatus shall provide a flow of air through the test chamber and over the test specimens. Control of the specimen and the black-panel temperature should be accomplished by thermostatic control of the blower. Black-panel temperature should be [illegible] through the window in the test chamber door with[illegible] door.

4.2.7 The apparatus should be equ[illegible] to spray the specimens uniformly wit[illegible] should be of stainless steel, plastic, [illegible] that does not react with or contaminate th[illegible]

4.2.8 Relative humidity in the t[illegible] be measured and controlled by a cont[illegible] should be regulated such that diffused [illegible] with moisture applied against the specimen h[illegible]

4.2.9 The apparatus shall include [illegible] measuring and controlling the same [illegible] water-cooled tension units.

5. General Procedure

5.1 Check to be sure the apparatus [illegible] at the start of each test. Check the [illegible] intervals to be sure the burner tube [illegible] clean, and that they have not exc[illegible] recommended period of use.

5.2 Prepare the instrument to [illegible]

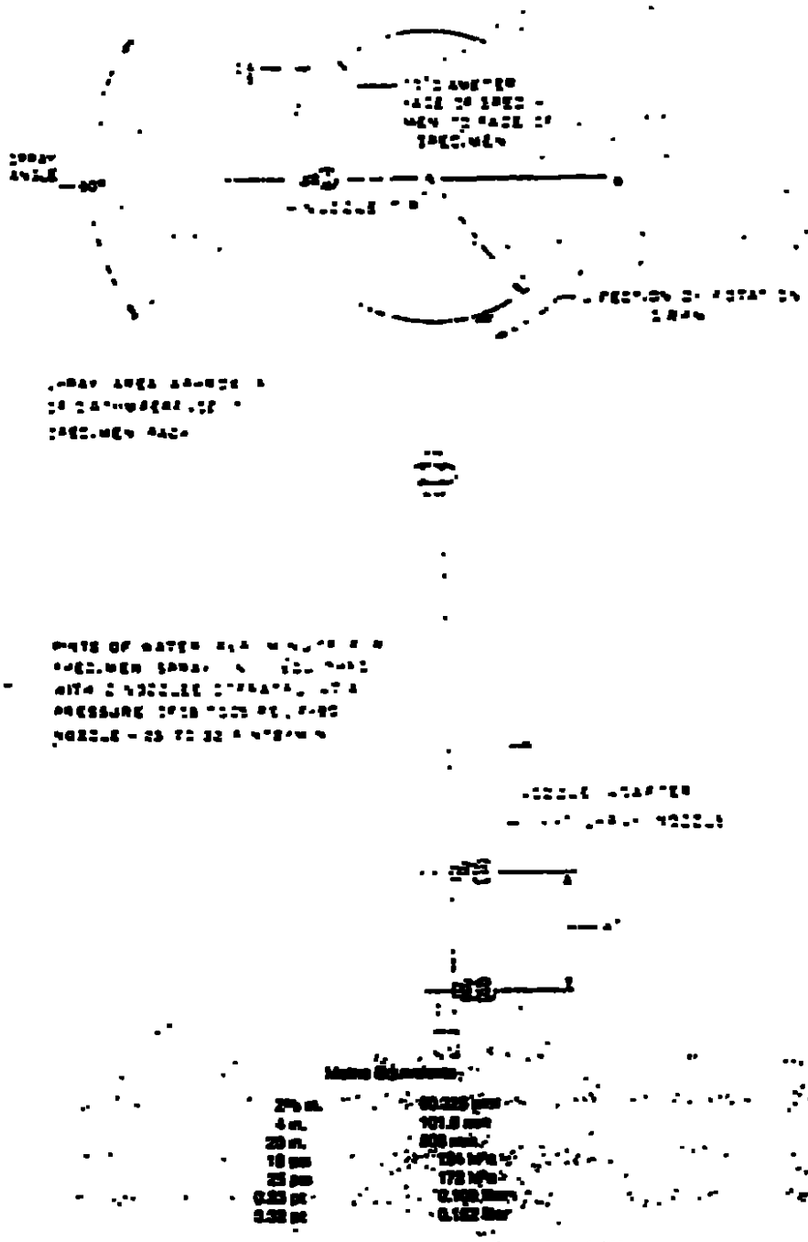


FIG. 3 Specimen Spray Arrangement for Type A and AH Apparatus

5.3 When the chamber dry-bulb temperature is blanks and the black-panel thermometer. Operate the ... trument in this manner while replacing the chamber ... bulb temperature to within two degrees ... specimens. ... black-panel ... Type C ... inside the desired relative humidity ...

6016374 · 110499

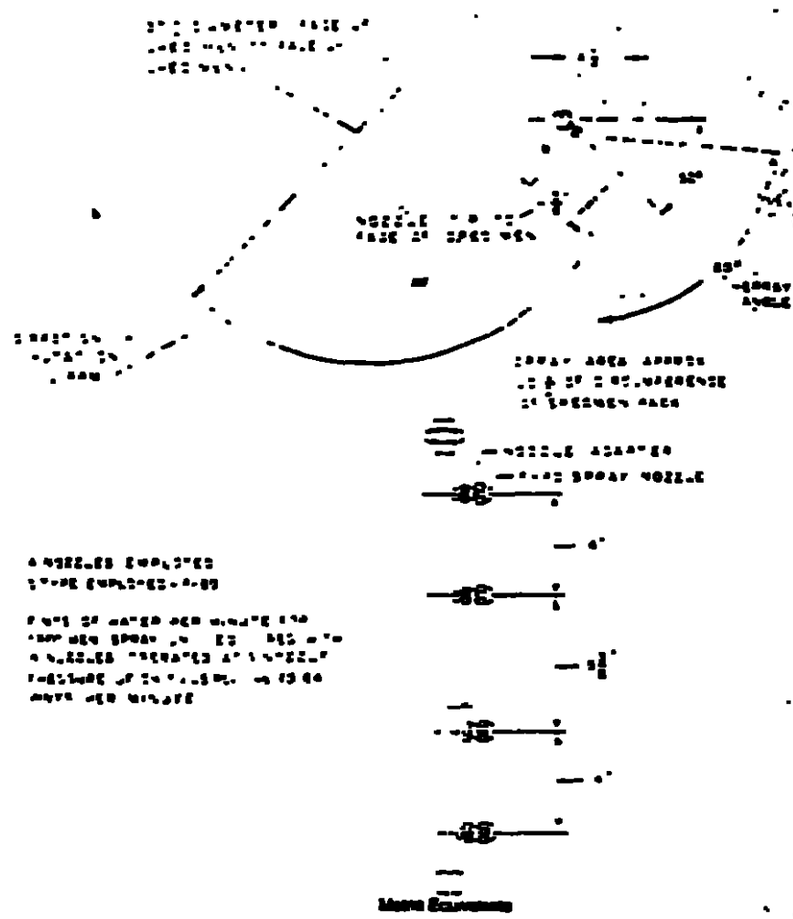


FIG. 4 Specimen Spray Arrangement for Type B and D Apparatus

level that will ensure the desired relative humidity.

5.3 In Types A, B, C, D, and E apparatus, use the type and number of spray nozzles (Figs. 2 and 3) recommended by the manufacturer and operate at a pressure of 124 to 172 kPa (18–25 psi) measured at the nozzle unless otherwise specified. Pass the specimen through the spray 1 to 2 times in each minute or revolution of the rack during the spray cycle. Allow the water to strike the test specimens in the form of a fine spray equally distributed over the specimens.

5.4.1 *Water used* [illegible]

Typically, the temperature of the [illegible] spray is near the ambient temperature [illegible] which the devices are operated (25 [illegible] specimen spray is chilled, specimens [illegible] rapid temperature changes that may not [illegible] exposures.

5.4.2 *Water Purity:*

5.4.2.1 The purity of water used [illegible] very important [illegible] [illegible] and soft organic and particu[illegible]

...Water used for specimen spray shall have no more deposits or stains on the exposed specimens. It is recommended that the water contain a maximum of 100 ppm and a minimum of 0.2 ppm silica. Silica shall be determined using the procedures defined in ...ASTM D 859 or Test Method D 4517. Prefiltered ...can be commercially available and be assumed ... conductivity of less than 5.0 mho per meter (corresponding to deionization and reverse osmosis treatment) effectively produce water with the desired purity. If ...water used is above 1 ppm solids, the solids and ...ash must be reported. Recirculation of water used for ...spray is not recommended and must not be done ...unless the recirculated water meets the above requirements.

...If specimens are found to have deposits or stains ...mature in the apparatus, the water purity must be ...to determine if it meets the requirements above. On ...occasions, exposed specimens can be contaminated by ...from bacteria that can grow in the purified water ...specimen spray. If bacterial contamination is ...the entire system used for specimen water spray ...cleaned with a chlorinating solution such as sodium ...hypochlorite and thoroughly rinsed prior to resuming exposures. Although it doesn't always correlate with such contamination, it is recommended that resistivity of water used for ...spray be continuously monitored and that exposures ...discontinued whenever the resistivity falls below one ...megohm.

...When the water purity requirement above are ...there is disagreement between parties on the extent ...of color caused by stain or deposit, the referee tests in an ...other laboratory which can meet the water quality ...details described in sections 5.4.2.1 and 5.4.2.2.

...Temperature of the rack spray water should be ...sufficiently low to reduce the specimen temperature below ...100°F when the specimen is continuously sprayed ...during the dark cycle.

...Reference Standards:

...Blue Wool Lightfastness Standards:[1]

...The eight standards (L-2 to L-9) have been made by ...dyeing wool yarn with the lightfast dye Eco Chrome Azurine B and ...with the fast dye Indigosol Blue AGG in different proportions. ...Blended wools were spun into yarns and the yarns woven into ...cloth. The amount of the dyes required and the ...of the two wools in the blends are often different from those ...actually used. The dyeing strengths and shading processes would ...be misleading, and they are intentionally not included.

...Any standard samples established by mutual agreement between the purchaser and the supplier.

ISO Gray Scale for Assessing Change in Color:[1]

...When the material to be evaluated is suspected of ...being sensitive to variations in radiant exposure and the ...test does not meet the requirement of 4.1.6, it is the ...responsibility of the concerned parties to mutually agree ...upon a measurement schedule for specimens as part ...of the exposure program in order to minimize any ...variations in irradiance might have as a function of ...position.

TEST METHOD A—CONTINUOUS EXPOSURE TO ... AND INTERMITTENT EXPOSURE TO WATER SP...

6. Procedure

6.1 Apparatus shall be Type A, B, AH, BH, C ... light-exposure device.

6.2 Program the instrument for continuous ... intermittent water spray in accordance with the manufacturer's instructions. Choice of the program selected ... mutual agreement among the interested parties. ... convention has established a cycle of 102 min ... followed by a cycle of 18 min of light and water ... commonly accepted program that permits the specified ... the maximum black-panel temperature during the ... portion of the cycle.

6.3 In Types AH and BH apparatus, adjust ... wet-bulb temperature control, humidifier, and ... heater controls to maintain the desired conditions ... fied in Section 5. In Types C, D, and E, adjust the ... temperature and humidity controls to maintain ... conditions as specified in Section 5.

6.4 In Types A and B with humidifier, humidity ... adjusted but not controlled.

6.4.1 Type B instruments without a humidifier ... operate with whatever humidity occurs from the evaporation of water in the bottom of the test chamber and ... specimen spray.

TEST METHOD B—ALTERNATE EXPOSURE TO LIGHT ... DARKNESS AND INTERMITTENT EXPOSURE TO W... SPRAY

7. Procedure

7.1 Apparatus shall be Type A, B, AH, BH, or E ... exposure device.

7.1.1 Types AH, BH, and E apparatus with ... humidity controls may be operated on alternate light ... dark cycles.

7.1.1.1 Operation during the light-on cycle ... described in Section 6.

7.1.1.2 Separate controls for temperature ... humidification may be adjusted during the dark ... automatic control as the program alternates from ... dark. In Type BH and E apparatus, rack spray ... specimens by wetting the unexposed back surface ... in development of condensation on the exposed ... surface during the dark cycle.

7.1.2 Types A, B, AH, BH, and E may be programmed ... operate on alternate light and dark cycles without ... relative humidity.

TEST METHOD C—CONTINUOUS EXPOSURE TO ... WITHOUT WATER SPRAY

8. Procedure

8.1 Apparatus shall be Types A, B, AH, BH, C ... light-exposure devices programmed for continuous ...

...ISO Recommendation No. 1... Document ISO/TC 38/SC ... 1975. [1] Under consideration for publication by ISO ... the present arrangement of the world, being USA may only ...

...inal filters C or D described in 4.1.2... not... be used.

...1.1 Adjust the controls on the apparatus so that the ...ack-panel temperature is 63 ± 3°C (145 ± 5°F) and the ...hamber humidity is 30 ± 5 % when the xenon lamp is ...erated at a wattage that provides 0.35 AATCC Fading Units ...posure in about 15 to 25 clock hours. Check at regular ...ervals and, when necessary, readjust the controls to ...aintain the specified values for these variables. Target ...alues for black panel temperature, 0.35 AATCC Fading ...nits, and relative humidity should be 63°C, 20 clock hours, ...nd 30 %, respectively.

...TE 5—0.35 AATCC Fading Units is equivalent to a 1.5 ± 0.2 ...AB-40) unit change in Blue Wool Lightfastness ISO Gray Scale ...xposure of about 110 kJ/m²·nm (1.5 W·m²·nm·h exposure at 420 nm ...ith xenon lamps sufficient to produce the specified exposure.

...1.2 Expose the material to be tested as determined by ...utual agreement among the concerned parties or, when not ...herwise specified, in accordance with one of the following:

...1.2.1 *Versus One AATCC Blue Wool Lightfastness ...tandard*—Expose the test specimen and any mutually ...greed-upon AATCC Blue Wool Lightfastness Standard ...ntil the selected standard between its exposed and unex...posed portion exhibits a color change equal to Step 4 of the ISO Gray Scale. Report the results by any mutually agreed-upon method of measuring change in the test specimen.

...1.2.2 *Versus Set of AATCC Blue Wool Lightfastness ...tandards*—Expose the test specimen and a set of AATCC Blue Wool Lightfastness Standards until a maximum permissible amount of change, as determined by any specified or mutually agreed-upon method of measurement, occurs in the test specimen. Assign it a classification number equal to that of the numbered standard that most nearly exhibits a change in color equal to Step 4 on the ISO Gray Scale between its exposed and unexposed portion. Where one standard shows a color change greater than Step 4 and the next higher number standard shows less than a Step 4 color change, an intermediate or half-grade rating may be used.

...1.2.3 *Versus Other Standard Samples*—Expose the test specimen and any mutually agreed-upon standard sample until either, by any specified or mutually agreed-upon method of measurement, shows an agreed-upon amount of change. Report the results on the basis of a comparison of the specimen with the standard sample.

TEST METHOD D—ALTERNATE EXPOSURE TO LIGHT AND DARKNESS WITHOUT WATER SPRAY

9. Procedure

9.1 Apparatus shall be Types A, B, AH, BH, or E programmed to predetermined cycles of light and darkness, by turning off the xenon arc.

NOTE 6—Type B apparatus not equipped with a vaporizing unit do not meet the requirements of Test Method D. In Type A and Type B apparatus with intermittent blacker operation during the light-off cycle (as the manner in, continuous, operation, the test chamber air temperature will drop to, (three) from air less the heat removed by vaporization of water from wicks and insulation.

9.1.1 Unless otherwise specified, exposure conditions shall be identical to [illegible] except that during the

conditions shall be [illegible] relative humidity and temperature of 35 ± 3°C (95 ± 5°F).

10. Report

10.1 Report the following information:

10.1.1 Type and model of exposure [illegible]

10.1.2 Type of light source and [illegible]

10.1.3 Type and age of filters [illegible]

10.1.4 Spectral irradiance at [illegible] (see Note 7),

10.1.5 Irradiation, kJ/m².

10.1.6 Elapsed exposure time, h.

10.1.7 Light- or dark-energy [illegible]

10.1.8 Operating black-panel [illegible]

10.1.9 Operating relative humidity [illegible]

10.1.10 Type of spray water.

10.1.10.1 Total solids and silica [illegible] specimen spray if above the limits [illegible]

10.1.11 Type of spray nozzle, and

10.1.12 Specimen rotation procedure [illegible]

NOTE 7—When direct measurement of [illegible] spectral irradiance cannot be made, data supplied by the manufacturer shall be submitted. Irradiance in kilowatts per square meter may be calculated by multiplying the product of the irradiance in watts per square meter and the exposure time in hours by the factor 3.6.

11. Precision and Bias

11.1 *Precision*:

11.1.1 The repeatability and reproducibility of results obtained in exposures conducted according to this practice will vary with the materials being [illegible] the material property being measured, and the specific [illegible] conditions and cycles that are used. In round-robin studies conducted by ASTM subcommittee G03.03, the 60° gloss [illegible] of duplicate PVC tape specimens exposed in different laboratories using identical test devices and exposure cycles [illegible] significant variability. The variability shown in [illegible] round-robin studies restricts the use of "absolute" [illegible] such as requiring a specific property level after a [illegible] exposure period.

11.1.1.1 If a standard or specification [illegible] material use requires a definite property level after [illegible] time or radiant exposure in an exposure test conforming to this practice, the specified property [illegible] on results obtained in a round-robin, [illegible] consideration the variability due to the [illegible] test method used to measure the [illegible] The round-robin test shall be [illegible] E 691 and shall include [illegible] of all laboratories or organizations [illegible] conduct the exposure and property [illegible]

11.1.1.2 If a standard or [illegible] or three parties require a [illegible] specific time or radiant exposure, in [illegible] conducted according to this practice, the [illegible] shall be based on statistical analysis [illegible]

[illegible] Plastic, R. M., "Effect of Rapid [illegible]

...ments. Independent exposures in each laboratory. The ...n the experiment used to determine the specification ...ude any consideration for variability due to the ...ns, and the test method used to measure the property ...test.

...3 The time-to-rupture studies demonstrated that ...n values for a series of materials could be ranked with ...evel of reproducibility between laboratories. When ...ability in results from an exposure test conducted ...ing to this practice have not been established through ...ction testing, performance requirements for materials ...be specified in terms of comparison (ranked) to a ...control specimen. The control specimen shall be ...simultaneously with the test specimens) in the ... The specific control material used shall be agreed ... the concerned parties. Expose replicates of the ... and the control specimen so that statistically ... performance differences can be determined.

...1.2 Bias ...

...1.3 Bias cannot be determined because ... standard weathering reference materials are ...

12. Keywords

12.1 degradation; ultraviolet weathering; ...

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

60163744 'J10H99

Colorfastness to Water Spotting

Developed in 1962 by AATCC Committee RA23; reaffirmed 1966, 1969, 1972, 1975, 1978, 1988, 1988; editorially revised and reaffirmed 1981, 1983, 1994. Technically equivalent to ISO 105-E07.

1. Purpose and Scope

1.1 This test method is designed to evaluate the resistance to water spotting of dyed, printed, or otherwise colored textile fabrics.

1.2 The test method does not determine whether the discoloration is removable.

2. Principle

2.1 The test specimen is spotted with distilled or deionized water and evaluation is made of change of color, after wetting and after drying.

3. Terminology

3.1 colorfastness, n.—the resistance of a material to change in any of its color characteristics, to transfer of its colorant(s) to adjacent materials, or both, as a result of the exposure of the material to any environment that might be encountered during the processing, testing, storage or use of the material.

4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

5. Apparatus and Materials

5.1 Glass rod.

5.2 AATCC Gray Scale for Color Change (see 11.1).

5.3 Pipette, graduated, 1 mL.

5.4 Distilled or deionized water.

6. Test Specimens

6.1 Colored cloth specimens, approximately 15.2 x 15.2 cm (6 x 6 in.).

7. Procedure

7.1 With tip of pipette in contact with cloth, run onto the specimen 0.15 mL water at room temperature. If necessary, work water in with a rounded glass rod to assist penetration.

7.2 Evaluate the change in color in the periphery of the spot after 2 min wetting and after drying at room temperature by use of the Gray Scale for Color Change.

8. Evaluation

8.1 Rate the effect on the color of the test specimens by the Gray Scale for Color Change (see 11.1).

Grade 5—negligible or no change as shown in Gray Scale Step 5.

Grade 4-5—change in color equivalent to Gray Scale Step 4-5.

Grade 4—change in color equivalent to Gray Scale Step 4.

Grade 3-4—change in color equivalent to Gray Scale Step 3-4.

Grade 3—change in color equivalent to Gray Scale Step 3.

Grade 2-3—change in color equivalent to Gray Scale Step 2-3.

Grade 2—change in color equivalent to Gray Scale Step 2.

Grade 1-2—change in color equivalent to Gray Scale Step 1-2.

Grade 1—change in color equivalent to Gray Scale Step 1.

9. Report

9.1 Report type of water and pH of water used for the test.

9.2 Report the grade for change in color after 2 min and after drying at room temperature.

10. Precision and Bias

10.1 *Precision.* Precision for this test method has not been established. There is no contemplated activity to establish precision for this method. Users of this method should use standard statistical techniques in making any comparisons of test results for either *within-laboratory* or *between-laboratory* averages.

10.2 *Bias.* Colorfastness to water spotting can be defined only in terms of this test method. There is no independent method for determining the true value. As a means of estimating this property, this method has no known bias.

11. Note

11.1 Available from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: 919/549-8141; fax: 919/549-8933; e-mail: orders@aatcc.org.

		CIE						
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE A Burgundy Standard		D65	10	28.4	28.7	2.6		
TYPE A Magenta Standard		D65	10	34.4	49.3	9.4		
TYPE A Orange Standard		D65	10	45.3	42.9	26.8		
TYPE A Red Standard		D65	10	36.1	47.9	15.5		
TYPE A Yellow Standard		D65	10	82.5	6.3	84.2		
TYPE A Green Standard		D65	10	61.2	-21.5	54.9		
TYPE A Cyan Standard		D65	10	48.4	-26.1	-26.1		
TYPE A Blue Standard		D65	10	29.2	6.6	-18.7		
TYPE A Black Standard		D65	10	21.5	6.3	-13.1		
TYPE A Lavendar Standard		D65	10	28.1	19.2	-12.1		
TYPE A Burgundy	Water Washed	D65	10	29.4	30.3	-0.1	3.3	2.8
TYPE A Magenta	Water Washed	D65	10	37.1	54.2	10.7	5.7	0.3
TYPE A Orange	Water Washed	D65	10	48.8	48.0	24.8	5.6	-4.2
TYPE A Red	Water Washed	D65	10	39.9	53.5	15.9	6.3	-1.3
TYPE A Yellow	Water Washed	D65	10	86.3	-6.3	81.4	13.5	12.8
TYPE A Green	Water Washed	D65	10	66.6	-38.9	54.0	18.3	15.7
TYPE A Cyan	Water Washed	D65	10	50.9	-31.7	-29.8	7.1	-1.4
TYPE A Blue	Water Washed	D65	10	28.1	7.1	-23.4	4.9	-1.0
TYPE A Black	Water Washed	D65	10	22.8	5.4	-16.8	3.8	-2.1
TYPE A Lavendar	Water Washed	D65	10	28.3	18.9	-15.9	3.8	-3.2
TYPE A Burgundy	Detergent Washed	D65	10	37.2	30.7	-8.2	14.1	10.8
TYPE A Magenta	Detergent Washed	D65	10	44.3	52.7	-0.5	14.4	10.2
TYPE A Orange	Detergent Washed	D65	10	53.8	39.7	13.8	15.9	-10.2
TYPE A Red	Detergent Washed	D65	10	45.9	49.8	5.0	14.4	-10.7
TYPE A Yellow	Detergent Washed	D65	10	83.2	-8.2	53.3	34.2	15.3
TYPE A Green	Detergent Washed	D65	10	67.0	-35.8	37.1	23.5	21.8
TYPE A Cyan	Detergent Washed	D65	10	52.8	-29.5	-29.7	6.5	0.2
TYPE A Blue	Detergent Washed	D65	10	32.8	5.7	-26.2	8.3	-2.8
TYPE A Black	Detergent Washed	D65	10	25.0	4.5	-18.8	7.0	-3.8
TYPE A Lavendar	Detergent Washed	D65	10	31.7	18.5	-21.7	11.1	-7.8
TYPE A Burgundy	Steamed	D65	10	25.7	23.7	3.3	5.7	1.3
TYPE A Magenta	Steamed	D65	10	33.5	49.9	12.0	2.7	2.3
TYPE A Orange	Steamed	D65	10	40.4	48.7	31.5	8.9	0.9
TYPE A Red	Steamed	D65	10	34.3	49.3	19.3	4.5	3.1
TYPE A Yellow	Steamed	D65	10	85.5	-1.6	99.8	17.7	8.4
TYPE A Green	Steamed	D65	10	60.9	-36.6	61.2	16.4	10.8
TYPE A Cyan	Steamed	D65	10	45.7	-34.0	-61.8	36.7	14.4
TYPE A Blue	Steamed	D65	10	25.0	3.6	-18.1	5.1	-2.7
TYPE A Black	Steamed	D65	10	21.0	2.0	-12.2	4.4	-3.8
TYPE A Lavender	Steamed	D65	10	22.9	13.3	-12.4	6.7	-3.8
TYPE A Burgundy	Steamed & Washed	D65	10	25.7	23.7	2.5	0.8	-0.7
TYPE A Magenta	Steamed & Washed	D65	10	33.9	51.0	12.9	1.9	1.0
TYPE A Orange	Steamed & Washed	D65	10	41.2	50.0	31.9	1.6	-0.4
TYPE A Red	Steamed & Washed	D65	10	34.9	50.4	20.6	1.6	0.5
TYPE A Yellow	Steamed & Washed	D65	10	85.8	-3.2	98.1	2.1	1.6
TYPE A Green	Steamed & Washed	D65	10	60.2	-37.8	58.8	2.7	2.2
TYPE A Cyan	Steamed & Washed	D65	10	44.7	-28.1	-27.9	0.9	0.6
TYPE A Blue	Steamed & Washed	D65	10	24.8	4.5	-18.4	1.1	1.0
TYPE A Black	Steamed & Washed	D65	10	20.7	2.3	-12.3	0.3	0.2
TYPE A Lavendar	Steamed & Washed	D65	10	22.9	13.8	-12.4	0.5	0.4
TYPE A Burgundy	Steamed & Detergent Washed	D65	10	25.9	24.6	1.8	1.8	-1.7
TYPE A Magenta	Steamed & Detergent Washed	D65	10	35.0	52.3	11.5	2.9	-0.8
TYPE A Orange	Steamed & Detergent Washed	D65	10	41.5	50.6	32.7	2.4	-0.1
TYPE A Red	Steamed & Detergent Washed	D65	10	35.6	51.7	20.0	2.7	-0.5
TYPE A Yellow	Steamed & Detergent Washed	D65	10	86.0	-3.5	99.7	2.0	1.9
TYPE A Green	Steamed & Detergent Washed	D65	10	61.0	-39.0	60.7	2.2	2.1
TYPE A Cyan	Steamed & Detergent Washed	D65	10	45.5	-27.8	-29.2	2.0	1.7
TYPE A Blue	Steamed & Detergent Washed	D65	10	24.9	4.5	-19.3	1.6	0.8
TYPE A Black	Steamed & Detergent Washed	D65	10					
TYPE A Lavender	Steamed & Detergent Washed	D65	10					

5015374-110499

Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE B Burgundy Standard		D65	10	30.3	29.4	3.7		
TYPE B Magenta Standard		D65	10	35.2	48.2	9.5		
TYPE B Orange Standard		D65	10	44.9	42.6	27.2		
TYPE B Red Standard		D65	10	36.7	47.9	18.4		
TYPE B Yellow Standard		D65	10	84.4	6.1	85.6		
TYPE B Green Standard		D65	10	62.2	-21.7	52.9		
TYPE B Cyan Standard		D65	10	48.6	-25.4	-24.0		
TYPE B Blue Standard		D65	10	30.6	6.2	-15.7		
TYPE B Black Standard		D65	10	24.0	7.2	-12.5		
TYPE B Lavendar Standard		D65	10	27.7	18.4	-9.3		
TYPE B Burgundy	Water Washed	D65	10	29.1	28.9	0.8	3.2	-2.8
TYPE B Magenta	Water Washed	D65	10	34.7	49.2	9.7	1.2	0.0
TYPE B Orange	Water Washed	D65	10	43.0	43.9	26.1	2.6	-1.6
TYPE B Red	Water Washed	D65	10	35.7	48.4	15.3	1.6	-1.2
TYPE B Yellow	Water Washed	D65	10	80.1	-1.3	79.9	10.3	7.2
TYPE B Green	Water Washed	D65	10	60.6	-34.5	49.8	13.2	12.7
TYPE B Cyan	Water Washed	D65	10	47.5	-33.4	-23.6	8.1	-5.4
TYPE B Blue	Water Washed	D65	10	27.3	3.7	-18.7	5.2	-3.2
TYPE B Black	Water Washed	D65	10	23.3	3.4	-14.1	4.2	-4.1
TYPE B Lavendar	Water Washed	D65	10	25.3	17.3	-11.8	3.7	-2.8
TYPE B Burgundy	Detergent Washed	D65	10	30.8	28.3	-1.7	5.5	5.3
TYPE B Magenta	Detergent Washed	D65	10	35.9	47.8	5.7	3.9	-3.7
TYPE B Orange	Detergent Washed	D65	10	43.3	40.9	19.1	8.4	-6.3
TYPE B Red	Detergent Washed	D65	10	36.1	47.0	9.1	7.5	-6.9
TYPE B Yellow	Detergent Washed	D65	10	78.6	-1.1	69.2	19.5	6.7
TYPE B Green	Detergent Washed	D65	10	50.5	-24.5	24.6	30.8	17.4
TYPE B Cyan	Detergent Washed	D65	10	46.3	-30.9	-25.4	8.2	-2.8
TYPE B Blue	Detergent Washed	D65	10	28.2	4.2	-20.6	5.9	-3.3
TYPE B Black	Detergent Washed	D65	10	26.6	2.4	-18.9	7.0	-5.9
TYPE B Lavendar	Detergent Washed	D65	10	27.7	17.4	-14.7	5.5	-5.0
TYPE B Burgundy	Steamed	D65	10	28.3	24.9	2.2	6.2	-1.0
TYPE B Magenta	Steamed	D65	10	33.6	48.9	9.9	1.8	0.3
TYPE B Orange	Steamed	D65	10	39.8	47.1	30.0	7.4	0.0
TYPE B Red	Steamed	D65	10	34.3	48.4	16.3	3.2	1.7
TYPE B Yellow	Steamed	D65	10	86.2	-1.8	101.6	17.9	8.3
TYPE B Green	Steamed	D65	10	58.8	-40.8	56.9	18.7	14.6
TYPE B Cyan	Steamed	D65	10	44.6	-27.2	-27.8	5.8	1.5
TYPE B Blue	Steamed	D65	10	28.3	3.7	-18.2	5.6	-3.1
TYPE B Black	Steamed	D65	10	23.5	2.2	-13.2	5.1	-4.9
TYPE B Lavendar	Steamed	D65	10	24.3	15.2	-12.6	5.7	-4.5
TYPE B Burgandy	Steamed & Washed	D65	10	28.97	28.24	3.47	1.94	1.03
TYPE B Magenta	Steamed & Washed	D65	10	33.52	50.23	11.94	1.78	1.23
TYPE B Orange	Steamed & Washed	D65	10	40.79	48.01	30.36	1.61	-0.13
TYPE B Red	Steamed & Washed	D65	10	34.52	48.89	16.83	0.52	0.01
TYPE B Yellow	Steamed & Washed	D65	10	86.35	-3.71	97.90	3.95	1.92
TYPE B Green	Steamed & Washed	D65	10	60.98	-42.13	57.86	2.38	0.40
TYPE B Cyan	Steamed & Washed	D65	10	44.86	-27.54	-28.52	0.94	0.64
TYPE B Blue	Steamed & Washed	D65	10	26.43	4.78	-19.09	1.02	0.28
TYPE B Black	Steamed & Washed	D65	10	23.09	2.57	-13.17	0.81	0.60
TYPE B Lavendar	Steamed & Washed	D65	10	23.91	15.43	-12.23	0.52	0.39
TYPE B Burgandy	Steamed & Detergent Washed	D65	10	28.71	28.98	2.09	1.20	-0.28
TYPE B Magenta	Steamed & Detergent Washed	D65	10	33.68	51.47	11.84	7.85	-7.80
TYPE B Orange	Steamed & Detergent Washed	D65	10	40.71	48.85	31.49	2.67	0.36
TYPE B Red	Steamed & Detergent Washed	D65	10	34.56	49.67	16.81	1.20	-0.29
TYPE B Yellow	Steamed & Detergent Washed	D65	10	86.37	-3.72	99.19	2.88	1.89
TYPE B Green	Steamed & Detergent Washed	D65	10	59.77	-42.47	57.86	1.72	0.80
TYPE B Cyan	Steamed & Detergent Washed	D65	10	45.88	-27.80	-28.53	1.48	0.61
TYPE B Blue	Steamed & Detergent Washed	D65	10	26.25	5.85	-19.38	1.76	1.02
TYPE B Black	Steamed & Detergent Washed	D65	10	23.51	3.52	-13.98	1.56	1.39
TYPE B Lavendar	Steamed & Detergent Washed	D65	10	23.73	16.15	-12.85	0.96	0.52

5 1537411 110499

Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE C Burgundy Standard		D65	10	28.4	31.0	4.4		
TYPE C Magenta Standard		D65	10	35.1	53.4	10.8		
TYPE C Orange Standard		D65	10	43.7	48.2	32.1		
TYPE C Red Standard		D65	10	36.8	52.0	19.5		
TYPE C Yellow Standard		D65	10	84.7	5.1	94.8		
TYPE C Green Standard		D65	10	61.9	-24.8	57.0		
TYPE C Cyan Standard		D65	10	49.3	-25.1	-26.4		
TYPE C Blue Standard		D65	10	29.9	7.8	-18.1		
TYPE C Black Standard		D65	10	24.9	7.6	-13.8		
TYPE C Lavender Standard		D65	10	26.8	20.4	-12.9		
TYPE C Burgundy	Water Washed	D65	10	51.2	30.5	-11.4	27.7	15.7
TYPE C Magenta	Water Washed	D65	10	56.8	51.1	-4.9	26.8	15.6
TYPE C Orange	Water Washed	D65	10	66.8	33.2	6.6	37.5	-17.3
TYPE C Red	Water Washed	D65	10	56.8	46.6	0.6	29.3	-17.5
TYPE C Yellow	Water Washed	D65	10	86.8	-6.8	25.8	70.0	15.6
TYPE C Green	Water Washed	D65	10	79.2	-29.1	17.4	43.4	28.2
TYPE C Cyan	Water Washed	D65	10	69.7	-30.9	-22.2	21.8	-7.0
TYPE C Blue	Water Washed	D65	10	52.4	6.0	-25.5	23.8	-3.8
TYPE C Black	Water Washed	D65	10	43.0	2.9	-23.9	21.2	-7.2
TYPE C Lavender	Water Washed	D65	10	48.1	19.1	-22.4	28.4	-8.0
TYPE C Burgundy	Detergent Washed	D65	10	58.3	21.4	-11.3	36.1	16.9
TYPE C Magenta	Detergent Washed	D65	10	61.4	42.3	-6.4	33.2	16.7
TYPE C Orange	Detergent Washed	D65	10	71.2	25.2	5.4	44.7	-14.5
TYPE C Red	Detergent Washed	D65	10	65.8	37.1	-0.4	38.2	16.8
TYPE C Yellow	Detergent Washed	D65	10	89.5	-5.4	18.9	75.8	14.0
TYPE C Green	Detergent Washed	D65	10	79.8	-26.6	10.7	48.7	32.1
TYPE C Cyan	Detergent Washed	D65	10	71.4	-30.4	-20.1	23.6	-8.3
TYPE C Blue	Detergent Washed	D65	10	60.1	-1.3	-23.4	31.9	-9.6
TYPE C Black	Detergent Washed	D65	10	51.8	-4.7	-24.2	31.1	-13.3
TYPE C Lavender	Detergent Washed	D65	10	85.7	11.2	-21.9	31.8	-12.8
TYPE C Burgundy	Steamed	D65	10	25.5	28.6	1.5	4.8	-2.7
TYPE C Magenta	Steamed	D65	10	34.3	55.9	11.7	2.9	0.4
TYPE C Orange	Steamed	D65	10	41.3	52.4	35.9	8.2	0.7
TYPE C Red	Steamed	D65	10	35.1	54.3	22.2	3.9	1.8
TYPE C Yellow	Steamed	D65	10	88.0	-2.4	101.7	10.3	7.8
TYPE C Green	Steamed	D65	10	59.8	-45.3	58.6	20.9	17.0
TYPE C Cyan	Steamed	D65	10	46.8	-29.5	-30.5	6.8	-0.4
TYPE C Blue	Steamed	D65	10	25.2	6.2	-23.6	7.3	-3.0
TYPE C Black	Steamed	D65	10	21.8	4.4	-16.2	4.9	-3.7
TYPE C Lavender	Steamed	D65	10	22.7	18.9	-16.6	5.7	-3.9
TYPE C Burgundy	Steamed & Washed	D65	10	27.4	31.7	1.0	4.1	-0.6
TYPE C Magenta	Steamed & Washed	D65	10	37.8	59.4	9.4	5.5	-2.9
TYPE C Orange	Steamed & Washed	D65	10	44.8	52.3	37.9	3.9	1.8
TYPE C Red	Steamed & Washed	D65	10	38.4	57.1	23.5	4.4	-0.1
TYPE C Yellow	Steamed & Washed	D65	10	88.1	-8.8	95.9	8.9	6.8
TYPE C Green	Steamed & Washed	D65	10	62.4	-52.2	58.7	7.5	6.3
TYPE C Cyan	Steamed & Washed	D65	10	49.3	-31.0	-31.1	3.1	-0.8
TYPE C Blue	Steamed & Washed	D65	10	27.7	7.0	-26.0	3.7	-0.2
TYPE C Black	Steamed & Washed	D65	10	23.8	5.5	-18.9	3.7	0.2
TYPE C Lavender	Steamed & Washed	D65	10	25.5	22.0	-19.5	5.3	-0.2
TYPE C Burgundy	Steamed & Detergent Washed	D65	10	27.2	31.3	0.6	3.7	-0.9
TYPE C Magenta	Steamed & Detergent Washed	D65	10	37.0	59.0	9.7	4.7	-2.8
TYPE C Orange	Steamed & Detergent Washed	D65	10	44.9	51.2	38.3	4.3	2.6
TYPE C Red	Steamed & Detergent Washed	D65	10	39.1	56.7	21.7	4.8	-1.5
TYPE C Yellow	Steamed & Detergent Washed	D65	10	88.6	-8.6	96.0	7.4	4.8
TYPE C Green	Steamed & Detergent Washed	D65	10	62.0	-52.1	58.2	7.5	6.8
TYPE C Cyan	Steamed & Detergent Washed	D65	10	49.1	-31.7	-30.7	3.3	-1.4
TYPE C Blue	Steamed & Detergent Washed	D65	10	27.8	6.8	-25.9	3.7	-0.4
TYPE C Black	Steamed & Detergent Washed	D65	10	23.9	4.9	-19.0	3.8	-0.3
TYPE C Lavender	Steamed & Detergent Washed	D65	10	24.7	21.8	-19.8	5.1	-0.5

6015374.110499

D4357
356

Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE D Burgundy Standard		D65	10	28.3	27.8	2.8		
TYPE D Magenta Standard		D65	10	34.7	50.3	11.4		
TYPE D Orange Standard		D65	10	44.5	43.9	27.2		
TYPE D Red Standard		D65	10	36.7	48.2	16.2		
TYPE D Yellow Standard		D65	10	84.2	4.6	85.9		
TYPE D Green Standard		D65	10	61.7	-24.6	52.9		
TYPE D Cyan Standard		D65	10	49.7	-25.9	-23.8		
TYPE D Blue Standard		D65	10	30.7	7.5	-16.8		
TYPE D Black Standard		D65	10	22.4	9.0	-13.5		
TYPE D Lavendar Standard		D65	10	28.8	17.8	-11.2		
TYPE D Burgundy	Water Washed	D65	10	28.0	27.8	1.3	1.5	-1.4
TYPE D Magenta	Water Washed	D65	10	36.0	52.7	13.0	3.1	0.9
TYPE D Orange	Water Washed	D65	10	42.8	50.2	28.2	6.8	-2.4
TYPE D Red	Water Washed	D65	10	37.2	51.8	16.9	3.7	-0.5
TYPE D Yellow	Water Washed	D65	10	87.0	-7.5	93.5	14.7	12.2
TYPE D Green	Water Washed	D65	10	64.8	-44.3	58.2	20.7	14.1
TYPE D Cyan	Water Washed	D65	10	54.1	-33.3	-29.3	10.4	-0.7
TYPE D Blue	Water Washed	D65	10	28.4	9.5	-22.6	6.5	-0.4
TYPE D Black	Water Washed	D65	10	22.2	7.5	-15.8	2.8	-2.5
TYPE D Lavender	Water Washed	D65	10	28.3	18.8	-14.8	4.3	-2.2
TYPE D Burgundy	Detergent Washed	D65	10	29.1	29.6	-2.8	5.8	5.3
TYPE D Magenta	Detergent Washed	D65	10	37.2	52.3	6.7	8.7	-6.0
TYPE D Orange	Detergent Washed	D65	10	43.2	48.7	25.8	6.1	-3.6
TYPE D Red	Detergent Washed	D65	10	37.7	52.0	14.1	4.5	-3.1
TYPE D Yellow	Detergent Washed	D65	10	85.1	-8.7	89.4	12.1	11.5
TYPE D Green	Detergent Washed	D65	10	62.8	-43.9	53.3	19.4	16.1
TYPE D Cyan	Detergent Washed	D65	10	52.8	-32.7	-28.9	9.2	-0.8
TYPE D Blue	Detergent Washed	D65	10	28.7	9.3	-23.1	6.8	-0.7
TYPE D Black	Detergent Washed	D65	10	23.8	7.7	-17.6	4.6	-3.1
TYPE D Lavendar	Detergent Washed	D65	10	27.1	19.1	-16.4	5.8	-3.4
TYPE D Burgundy	Steamed	D65	10	26.2	28.8	4.4	2.8	1.5
TYPE D Magenta	Steamed	D65	10	34.6	53.1	13.7	3.6	1.5
TYPE D Orange	Steamed	D65	10	41.8	50.3	33.9	9.8	2.2
TYPE D Red	Steamed	D65	10	35.8	52.2	21.8	6.9	3.7
TYPE D Yellow	Steamed	D65	10	85.8	0.1	100.5	16.4	5.1
TYPE D Green	Steamed	D65	10	61.7	-30.0	60.8	9.4	1.6
TYPE D Cyan	Steamed	D65	10	49.2	-25.9	-24.7	1.2	0.8
TYPE D Blue	Steamed	D65	10	27.4	9.5	-18.2	4.1	1.2
TYPE D Black	Steamed	D65	10	21.4	8.8	-12.8	1.4	0.2
TYPE D Lavendar	Steamed	D65	10	24.4	19.0	-11.3	4.5	0.5
TYPE D Burgundy	Steamed & Washed	D65	10	28.8	28.0	4.1	1.1	-0.4
TYPE D Magenta	Steamed & Washed	D65	10	34.4	50.9	13.0	2.5	-0.2
TYPE D Orange	Steamed & Washed	D65	10	40.7	49.4	32.4	2.0	-0.8
TYPE D Red	Steamed & Washed	D65	10	34.8	50.5	20.8	2.0	-0.1
TYPE D Yellow	Steamed & Washed	D65	10	85.6	-5.3	97.0	6.1	5.4
TYPE D Green	Steamed & Washed	D65	10	61.6	-41.0	57.7	11.2	10.7
TYPE D Cyan	Steamed & Washed	D65	10	48.9	-30.0	-28.4	5.8	-0.1
TYPE D Blue	Steamed & Washed	D65	10	26.6	8.6	-21.0	3.2	-2.3
TYPE D Black	Steamed & Washed	D65	10	21.2	5.7	-13.1	2.9	-2.8
TYPE D Lavendar	Steamed & Washed	D65	10	23.9	17.8	-12.2	1.7	-1.5
TYPE D Burgundy	Steamed & Detergent Washed	D65	10	28.4	28.3	-0.8	5.9	5.4
TYPE D Magenta	Steamed & Detergent Washed	D65	10	35.4	51.2	6.8	7.3	-6.4
TYPE D Orange	Steamed & Detergent Washed	D65	10	41.6	45.9	27.9	7.3	-2.7
TYPE D Red	Steamed & Detergent Washed	D65	10	36.6	49.6	14.6	7.5	-5.7
TYPE D Yellow	Steamed & Detergent Washed	D65	10	82.9	-8.0	87.5	15.2	8.5
TYPE D Green	Steamed & Detergent Washed	D65	10	61.5	-42.3	54.9	13.4	13.3
TYPE D Cyan	Steamed & Detergent Washed	D65	10	49.2	-30.5	-25.7	4.8	-2.3
TYPE D Blue	Steamed & Detergent Washed	D65	10	27.2	8.9	-21.8	3.7	-2.4
TYPE D Black	Steamed & Detergent Washed	D65	10	23.0	6.8	-16.1	4.8	-3.4
TYPE D Lavendar	Steamed & Detergent Washed	D65	10	25.2	18.5	-15.5	4.4	-3.8

6016374.1110499

			CIE			
Sample name	Time	Illum	Angle	L*	a*	b*	DE*
TYPE E Burgundy Standard		D65	10	28.3	28.3	3.0	
TYPE E Magenta Standard		D65	10	35.3	47.6	9.2	
TYPE E Orange Standard		D65	10	45.0	42.7	25.1	
TYPE E Red Standard		D65	10	36.6	46.9	15.6	
TYPE E Yellow Standard		D65	10	83.9	5.7	83.2	
TYPE E Green Standard		D65	10	62.3	-23.2	53.9	
TYPE E Cyan Standard		D65	10	50.6	-24.5	-24.6	
TYPE E Blue Standard		D65	10	31.8	8.2	-16.3	
TYPE E Black Standard		D65	10	22.2	9.0	-12.2	
TYPE E Lavendar Standard		D65	10	30.2	18.1	-9.7	
TYPE E Burgundy	Water Washed	D65	10	28.7	30.4	-0.2	3.8
TYPE E Magenta	Water Washed	D65	10	35.9	52.3	9.2	4.7
TYPE E Orange	Water Washed	D65	10	42.6	48.1	24.4	6.0
TYPE E Red	Water Washed	D65	10	37.0	52.0	15.4	5.1
TYPE E Yellow	Water Washed	D65	10	83.5	-4.4	85.4	10.3
TYPE E Green	Water Washed	D65	10	65.5	-41.8	56.9	19.0
TYPE E Cyan	Water Washed	D65	10	56.8	-34.4	-27.4	11.4
TYPE E Blue	Water Washed	D65	10	28.7	10.7	-22.2	7.2
TYPE E Black	Water Washed	D65	10	23.2	8.5	-16.2	4.2
TYPE E Lavendar	Water Washed	D65	10	27.1	20.5	-14.9	6.5
TYPE E Burgundy	Detergent Washed	D65	10	33.0	29.3	-4.0	9.9
TYPE E Magenta	Detergent Washed	D65	10	40.1	50.9	2.1	9.1
TYPE E Orange	Detergent Washed	D65	10	46.4	44.5	18.3	7.2
TYPE E Red	Detergent Washed	D65	10	41.5	49.4	7.0	10.1
TYPE E Yellow	Detergent Washed	D65	10	82.3	-5.7	70.4	17.2
TYPE E Green	Detergent Washed	D65	10	64.5	-40.6	43.6	20.4
TYPE E Cyan	Detergent Washed	D65	10	54.7	-32.5	-26.5	9.1
TYPE E Blue	Detergent Washed	D65	10	33.9	9.3	-25.2	9.2
TYPE E Black	Detergent Washed	D65	10	27.6	6.7	-20.9	10.6
TYPE E Lavendar	Detergent Washed	D65	10	32.2	19.6	-19.2	9.8
TYPE E Burgundy	Steamed	D65	10	28.5	29.2	5.4	3.8
TYPE E Magenta	Steamed	D65	10	33.9	52.0	13.9	6.6
TYPE E Orange	Steamed	D65	10	41.9	47.6	32.1	9.1
TYPE E Red	Steamed	D65	10	35.0	51.1	20.9	7.0
TYPE E Yellow	Steamed	D65	10	86.0	2.7	96.8	14.0
TYPE E Green	Steamed	D65	10	61.6	-26.8	58.7	6.1
TYPE E Cyan	Steamed	D65	10	49.8	-25.6	-24.9	1.4
TYPE E Blue	Steamed	D65	10	29.6	9.3	-16.7	2.5
TYPE E Black	Steamed	D65	10	21.8	8.6	-11.7	0.7
TYPE E Lavendar	Steamed	D65	10	26.3	19.5	-9.6	4.2
TYPE E Burgundy	Steamed & Washed	D65	10	28.0	28.6	4.1	1.5
TYPE E Magenta	Steamed & Washed	D65	10	33.6	51.3	13.0	0.9
TYPE E Orange	Steamed & Washed	D65	10	40.2	46.9	30.0	2.7
TYPE E Red	Steamed & Washed	D65	10	34.4	50.6	19.9	1.4
TYPE E Yellow	Steamed & Washed	D65	10	82.3	-5.6	88.9	11.7
TYPE E Green	Steamed & Washed	D65	10	62.3	-39.3	57.2	13.0
TYPE E Cyan	Steamed & Washed	D65	10	51.0	-32.7	-27.8	7.7
TYPE E Blue	Steamed & Washed	D65	10	28.4	8.8	-20.1	4.7
TYPE E Black	Steamed & Washed	D65	10	20.9	7.4	-13.8	2.4
TYPE E Lavendar	Steamed & Washed	D65	10	23.7	18.2	-10.7	3.1
TYPE E Burgundy	Steamed & Detergent Washed	D65	10	27.6	30.1	1.4	4.4
TYPE E Magenta	Steamed & Detergent Washed	D65	10	35.2	52.5	8.9	5.0
TYPE E Orange	Steamed & Detergent Washed	D65	10	42.6	48.8	28.8	3.4
TYPE E Red	Steamed & Detergent Washed	D65	10	36.3	51.4	17.1	4.1
TYPE E Yellow	Steamed & Detergent Washed	D65	10	84.7	-8.2	87.5	14.3
TYPE E Green	Steamed & Detergent Washed	D65	10	64.6	-42.1	57.8	15.9
TYPE E Cyan	Steamed & Detergent Washed	D65	10	51.6	-33.3	-26.0	8.0
TYPE E Blue	Steamed & Detergent Washed	D65	10	27.5	9.4	-21.0	4.9
TYPE E Black	Steamed & Detergent Washed	D65	10	22.2	7.0	-15.2	4.1
TYPE E Lavendar	Steamed & Detergent Washed	D65	10	24.5	18.8	-13.4	4.2

6015374.1140499

398
4
26
603519

359

DH°
3.2
-0.8
-3.3
-1.7
10.1
15.1
-4.4
-0.4
-2.6
-3.1
8.9
-7.4
-7.0
-8.9
11.4
20.3
-3.9
-2.5
-5.9
-6.7
2.3
3.7
3.2
3.6
3.7
1.3
-0.5
0.6
0.0
0.7
-1.2
-0.5
-1.3
-0.7
8.1
12.0
-2.6
-1.7
-2.2
-1.5
-4.2
-4.8
-2.5
-3.7
11.0
14.0
-4.3
-1.7
-3.3
-3.6

6016374.110499

		CIE						
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE F Burgundy Standard		D65	10	30.1	29.8	2.5		
TYPE F Magenta Standard		D65	10	36.4	50.9	9.2		
TYPE F Orange Standard		D65	10	44.9	45.4	28.7		
TYPE F Red Standard		D65	10	37.4	49.8	16.8		
TYPE F Yellow Standard		D65	10	84.6	5.2	92.3		
TYPE F Green Standard		D65	10	60.1	-26.6	53.7		
TYPE F Cyan Standard		D65	10	48.5	-27.0	-21.5		
TYPE F Blue Standard		D65	10	31.1	6.8	-17.6		
TYPE F Black Standard		D65	10	24.2	7.9	-14.0		
TYPE F Lavender Standard		D65	10	29.2	18.2	-12.4		
TYPE F Burgundy	Water Washed	D65	10	28.8	29.5	0.9	2.1	-1.6
TYPE F Magenta	Water Washed	D65	10	36.3	52.7	11.0	2.5	1.4
TYPE F Orange	Water Washed	D65	10	42.8	49.7	30.9	5.3	-0.4
TYPE F Red	Water Washed	D65	10	36.7	52.2	18.6	3.1	1.1
TYPE F Yellow	Water Washed	D65	10	85.9	-5.7	94.3	11.1	10.9
TYPE F Green	Water Washed	D65	10	61.9	-42.1	58.2	15.9	11.9
TYPE F Cyan	Water Washed	D65	10	51.8	-31.7	-29.4	9.8	2.9
TYPE F Blue	Water Washed	D65	10	27.8	7.4	-22.2	5.7	-1.0
TYPE F Black	Water Washed	D65	10	22.4	6.6	-15.0	2.5	-1.8
TYPE F Lavender	Water Washed	D65	10	26.0	18.0	-16.5	4.5	-2.6
TYPE F Burgundy	Detergent Washed	D65	10	27.8	29.0	1.5	2.8	-1.0
TYPE F Magenta	Detergent Washed	D65	10	35.7	52.6	10.3	2.2	0.8
TYPE F Orange	Detergent Washed	D65	10	42.9	49.3	29.8	4.5	-1.1
TYPE F Red	Detergent Washed	D65	10	36.9	51.8	17.6	2.0	0.2
TYPE F Yellow	Detergent Washed	D65	10	85.7	-4.5	94.3	9.9	9.7
TYPE F Green	Detergent Washed	D65	10	69.4	-38.9	66.1	12.5	9.9
TYPE F Cyan	Detergent Washed	D65	10	50.1	-27.4	-30.3	9.0	6.2
TYPE F Blue	Detergent Washed	D65	10	27.0	8.0	-21.9	6.0	-0.3
TYPE F Black	Detergent Washed	D65	10	21.9	7.5	-16.1	3.1	-1.3
TYPE F Lavender	Detergent Washed	D65	10	26.0	18.2	-15.9	4.8	-2.8
TYPE F Burgundy	Steamed	D65	10	27.3	30.5	4.3	3.4	1.7
TYPE F Magenta	Steamed	D65	10	35.3	54.2	12.6	4.8	2.7
TYPE F Orange	Steamed	D65	10	42.1	50.5	35.6	9.1	3.0
TYPE F Red	Steamed	D65	10	36.2	53.0	21.9	6.1	3.6
TYPE F Yellow	Steamed	D65	10	86.8	-1.9	105.6	15.1	7.3
TYPE F Green	Steamed	D65	10	60.2	-35.3	63.4	13.1	3.2
TYPE F Cyan	Steamed	D65	10	47.8	-27.4	-24.0	2.6	1.7
TYPE F Blue	Steamed	D65	10	27.0	9.1	-18.4	4.8	1.8
TYPE F Black	Steamed	D65	10	22.8	7.4	-13.1	1.8	0.0
TYPE F Lavender	Steamed	D65	10	25.5	19.3	-13.2	3.9	-0.1
TYPE F Burgundy	Steamed & Washed	D65	10	28.1	29.8	3.8	1.2	-0.9
TYPE F Magenta	Steamed & Washed	D65	10	35.9	53.9	11.6	0.6	-0.1
TYPE F Orange	Steamed & Washed	D65	10	42.4	50.7	35.6	1.9	-1.0
TYPE F Red	Steamed & Washed	D65	10	36.2	52.8	21.7	0.9	-0.8
TYPE F Yellow	Steamed & Washed	D65	10	84.7	-0.6	100.0	6.2	-1.3
TYPE F Green	Steamed & Washed	D65	10	59.5	-35.9	58.6	5.0	3.2
TYPE F Cyan	Steamed & Washed	D65	10	47.5	-26.5	-26.8	2.9	2.6
TYPE F Blue	Steamed & Washed	D65	10	26.9	8.5	-19.8	1.5	-1.2
TYPE F Black	Steamed & Washed	D65	10	22.9	8.0	-13.7	1.4	-1.4
TYPE F Lavender	Steamed & Washed	D65	10	25.8	18.9	-13.7	0.8	-0.7
TYPE F Burgundy	Steamed & Detergent Washed	D65	10	29.9	28.3	-1.1	6.5	5.8
TYPE F Magenta	Steamed & Detergent Washed	D65	10	37.8	53.7	6.2	6.0	-5.4
TYPE F Orange	Steamed & Detergent Washed	D65	10	45.8	45.9	30.7	9.2	-2.3
TYPE F Red	Steamed & Detergent Washed	D65	10	39.3	51.2	15.9	7.3	-5.6
TYPE F Yellow	Steamed & Detergent Washed	D65	10	83.2	-0.3	92.8	13.8	-1.8
TYPE F Green	Steamed & Detergent Washed	D65	10	59.7	-38.0	55.2	8.8	6.8
TYPE F Cyan	Steamed & Detergent Washed	D65	10	45.8	-28.2	-21.1	3.6	-2.8
TYPE F Blue	Steamed & Detergent Washed	D65	10	27.2	6.1	-19.4	1.8	-1.5
TYPE F Black	Steamed & Detergent Washed	D65	10	23.0	5.1	-14.0	2.4	-2.4
TYPE F Lavender	Steamed & Detergent Washed	D65	10	26.2	18.6	-16.0	2.9	-2.6

5015374-110499

		CIE						
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE G Burgundy Standard		D65	10	32.3	27.1	1.8		
TYPE G Magenta Standard		D65	10	37.2	44.4	5.6		
TYPE G Orange Standard		D65	10	46.7	39.1	22.7		
TYPE G Red Standard		D65	10	38.7	43.5	12.3		
TYPE G Yellow Standard		D65	10	82.6	6.0	79.6		
TYPE G Green Standard		D65	10	62.2	-20.6	49.4		
TYPE G Cyan Standard		D65	10	50.9	-24.9	-18.3		
TYPE G Blue Standard		D65	10	36.3	6.2	-14.2		
TYPE G Black Standard		D65	10	26.6	0.9	-12.3		
TYPE G Lavendar Standard		D65	10	33.9	18.1	-9.9		
TYPE G Burgundy	Water Washed	D65	10	28.9	31.4	0.0	5.8	2.0
TYPE G Magenta	Water Washed	D65	10	37.5	55.7	9.2	11.8	1.9
TYPE G Orange	Water Washed	D65	10	44.8	50.8	28.7	13.2	-0.5
TYPE G Red	Water Washed	D75	10	37.8	44.2	-5.6	17.9	17.9
TYPE G Yellow	Water Washed	D65	10	86.3	-6.1	80.8	16.8	12.1
TYPE G Green	Water Washed	D65	10	65.1	-40.7	58.4	22.1	13.1
TYPE G Cyan	Water Washed	D65	10	61.8	-30.6	-28.8	11.7	4.3
TYPE G Blue	Water Washed	D65	10	28.9	9.9	-22.8	12.0	0.0
TYPE G Black	Water Washed	D65	10	22.8	8.4	-15.8	5.2	-2.3
TYPE G Lavendar	Water Washed	D65	10	28.8	21.2	-16.9	10.4	-4.0
TYPE G Burgundy	Detergent Washed	D65	10	31.9	28.3	-4.8	6.7	6.8
TYPE G Magenta	Detergent Washed	D65	10	38.7	48.7	2.6	5.3	-3.2
TYPE G Orange	Detergent Washed	D65	10	45.5	40.7	17.9	5.2	-5.0
TYPE G Red	Detergent Washed	D65	10	39.9	48.5	7.9	5.4	-4.9
TYPE G Yellow	Detergent Washed	D65	10	72.4	2.7	60.5	21.9	2.1
TYPE G Green	Detergent Washed	D65	10	56.4	-32.5	37.3	17.9	16.4
TYPE G Cyan	Detergent Washed	D65	10	47.1	-25.2	-26.0	8.8	6.6
TYPE G Blue	Detergent Washed	D65	10	31.2	6.6	-21.8	9.2	-2.2
TYPE G Black	Detergent Washed	D65	10	25.2	7.5	-16.5	4.8	-3.3
TYPE G Lavendar	Detergent Washed	D65	10	31.1	17.6	-17.7	8.4	-6.8
TYPE G Burgundy	Steamed	D65	10	29.7	31.3	3.5	5.3	1.4
TYPE G Magenta	Steamed	D65	10	35.4	53.4	11.4	10.9	4.2
TYPE G Orange	Steamed	D65	10	42.9	48.7	32.4	14.2	3.2
TYPE G Red	Steamed	D65	10	37.3	50.9	16.1	9.5	3.3
TYPE G Yellow	Steamed	D65	10	84.8	1.8	95.4	16.5	4.9
TYPE G Green	Steamed	D65	10	62.8	-25.8	59.0	10.9	1.0
TYPE G Cyan	Steamed	D65	10	50.3	-24.6	-21.5	3.3	2.7
TYPE G Blue	Steamed	D65	10	32.9	9.3	-15.9	4.9	2.0
TYPE G Black	Steamed	D65	10	25.0	11.8	-15.9	4.8	0.1
TYPE G Lavendar	Steamed	D65	10	29.5	21.5	-11.0	5.6	0.8
TYPE G Burgundy	Steamed & Washed	D65	10	27.8	30.1	3.6	2.3	-0.2
TYPE G Magenta	Steamed & Washed	D65	10	35.1	53.0	11.4	0.8	0.3
TYPE G Orange	Steamed & Washed	D65	10	42.3	50.6	33.3	1.6	-0.2
TYPE G Red	Steamed & Washed	D65	10	36.0	52.7	20.8	4.2	2.4
TYPE G Yellow	Steamed & Washed	D65	10	83.9	-2.2	82.3	5.0	3.8
TYPE G Green	Steamed & Washed	D65	10	62.6	-38.5	59.3	12.6	10.8
TYPE G Cyan	Steamed & Washed	D65	10	48.6	-28.3	-26.2	6.3	1.1
TYPE G Blue	Steamed & Washed	D65	10	28.5	8.7	-20.4	6.5	-2.6
TYPE G Black	Steamed & Washed	D65	10	22.8	7.5	-14.0	3.7	-2.5
TYPE G Lavendar	Steamed & Washed	D65	10	26.0	21.3	-14.4	4.9	-3.4
TYPE G Burgundy	Steamed & Detergent Washed	D65	10	33.6	28.9	-3.5	8.8	7.4
TYPE G Magenta	Steamed & Detergent Washed	D65	10	41.2	51.4	2.7	10.4	-6.1
TYPE G Orange	Steamed & Detergent Washed	D65	10	48.5	42.5	21.8	14.0	-5.9
TYPE G Red	Steamed & Detergent Washed	D65	10	41.2	49.1	11.0	7.8	-5.8
TYPE G Yellow	Steamed & Detergent Washed	D65	10	80.2	-1.8	64.5	31.5	3.5
TYPE G Green	Steamed & Detergent Washed	D65	10	62.5	-38.5	39.5	22.0	19.3
TYPE G Cyan	Steamed & Detergent Washed	D65	10	48.2	-27.8	-21.9	3.8	-1.5
TYPE G Blue	Steamed & Detergent Washed	D65	10	32.9	6.1	-21.4	6.4	-5.1
TYPE G Black	Steamed & Detergent Washed	D65	10	28.9	6.3	-16.7	4.7	-4.3
TYPE G Lavender	Steamed & Detergent Washed	D65	10	32.7	17.8	-17.6	8.6	-7.8

6015374-110499

Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE H Burgundy Standard		D65	10	29.6	28.9	2.3		
TYPE H Magenta Standard		D65	10	36.0	50.5	9.3		
TYPE H Orange Standard		D65	10	44.8	45.3	29.1		
TYPE H Red Standard		D65	10	37.4	49.2	16.5		
TYPE H Yellow Standard		D65	10	83.7	5.5	91.8		
TYPE H Green Standard		D65	10	60.0	-26.1	54.1		
TYPE H Cyan Standard		D65	10	48.5	-27.4	-20.7		
TYPE H Blue Standard		D65	10	31.0	6.1	-17.3		
TYPE H Black Standard		D65	10	23.7	8.0	-13.5		
TYPE H Lavendar Standard		D65	10	26.8	18.1	-12.0		
TYPE H Burgundy	Water Washed	D65	10	29.5	29.6	-0.1	2.5	2.5
TYPE H Magenta	Water Washed	D65	10	36.7	53.1	10.3	2.8	0.5
TYPE H Orange	Water Washed	D65	10	43.5	50.0	32.0	5.6	-0.1
TYPE H Red	Water Washed	D65	10	37.3	52.7	16.6	4.1	0.8
TYPE H Yellow	Water Washed	D65	10	87.1	-5.7	96.8	12.7	11.2
TYPE H Green	Water Washed	D65	10	62.1	-43.2	57.0	17.4	12.9
TYPE H Cyan	Water Washed	D65	10	51.0	-31.8	-28.6	9.4	3.3
TYPE H Blue	Water Washed	D65	10	28.1	6.7	-21.9	5.5	-0.9
TYPE H Black	Water Washed	D65	10	22.7	6.5	-15.1	2.4	-2.0
TYPE H Lavendar	Water Washed	D65	10	25.7	17.8	-16.8	4.8	-3.1
TYPE H Burgundy	Detergent Washed	D65	10	31.4	27.8	-3.3	6.0	5.8
TYPE H Magenta	Detergent Washed	D65	10	38.0	50.2	4.8	5.1	-4.6
TYPE H Orange	Detergent Washed	D65	10	44.8	44.0	25.8	8.6	-3.9
TYPE H Red	Detergent Washed	D65	10	38.0	49.1	13.2	3.4	-3.2
TYPE H Yellow	Detergent Washed	D65	10	80.8	-4.1	77.6	17.3	9.5
TYPE H Green	Detergent Washed	D65	10	60.0	-40.9	46.6	16.5	16.4
TYPE H Cyan	Detergent Washed	D65	10	49.8	-31.2	-26.5	7.1	2.1
TYPE H Blue	Detergent Washed	D65	10	28.8	6.9	-22.5	5.7	-0.9
TYPE H Black	Detergent Washed	D65	10	23.5	6.7	-16.9	3.8	-2.8
TYPE H Lavendar	Detergent Washed	D65	10	28.6	16.3	-17.4	5.7	-5.2
TYPE H Burgundy	Steamed	D65	10	28.1	30.6	4.4	3.1	1.8
TYPE H Magenta	Steamed	D65	10	35.8	53.9	12.1	4.4	2.0
TYPE H Orange	Steamed	D65	10	43.0	50.2	35.5	8.2	2.8
TYPE H Red	Steamed	D65	10	36.8	52.4	21.0	5.8	3.2
TYPE H Yellow	Steamed	D65	10	85.7	0.7	102.4	11.7	5.1
TYPE H Green	Steamed	D65	10	59.9	-29.4	59.7	6.5	0.4
TYPE H Cyan	Steamed	D65	10	48.0	-26.5	-22.4	2.0	1.9
TYPE H Blue	Steamed	D65	10	29.3	8.3	-18.1	2.9	1.8
TYPE H Black	Steamed	D65	10	23.3	8.1	-12.9	0.7	0.4
TYPE H Lavendar	Steamed	D65	10	28.4	18.9	-12.8	2.5	0.0
TYPE H Burgundy	Steamed & Washed	D65	10	28.6	29.4	3.3	1.2	-0.4
TYPE H Magenta	Steamed & Washed	D65	10	35.4	53.4	12.8	0.8	0.7
TYPE H Orange	Steamed & Washed	D65	10	42.3	51.1	34.9	1.1	-0.8
TYPE H Red	Steamed & Washed	D65	10	36.4	52.2	21.0	0.4	0.1
TYPE H Yellow	Steamed & Washed	D65	10	85.7	-2.4	100.1	4.3	3.4
TYPE H Green	Steamed & Washed	D65	10	60.4	-38.7	58.1	9.5	8.9
TYPE H Cyan	Steamed & Washed	D65	10	47.4	-28.3	-26.3	3.9	3.1
TYPE H Blue	Steamed & Washed	D65	10	27.0	9.1	-20.0	3.3	0.1
TYPE H Black	Steamed & Washed	D65	10	22.1	7.3	-13.9	1.6	-1.0
TYPE H Lavendar	Steamed & Washed	D65	10	25.6	18.7	-13.6	1.2	-0.9
TYPE H Burgundy	Steamed & Detergent Washed	D65	10	29.7	28.2	-0.7	3.3	4.8
TYPE H Magenta	Steamed & Detergent Washed	D65	10	37.4	52.6	7.0	5.4	-4.7
TYPE H Orange	Steamed & Detergent Washed	D65	10	44.0	47.0	31.5	5.3	-1.3
TYPE H Red	Steamed & Detergent Washed	D65	10	38.7	50.8	16.1	5.4	-4.0
TYPE H Yellow	Steamed & Detergent Washed	D65	10	82.8	-1.1	88.6	14.8	2.1
TYPE H Green	Steamed & Detergent Washed	D65	10	59.8	-38.2	55.2	11.0	10.9
TYPE H Cyan	Steamed & Detergent Washed	D65	10	46.3	-28.2	-22.8	2.3	-0.8
TYPE H Blue	Steamed & Detergent Washed	D65	10	28.4	7.4	-20.6	2.8	-1.5
TYPE H Black	Steamed & Detergent Washed	D65	10	24.2	5.6	-15.7	3.7	-3.3
TYPE H Lavendar	Steamed & Detergent Washed	D65	10	27.5	16.0	-15.8	3.5	-3.1

6016374.1104499

Sample name	Time	Illum	Angle	CIE L*	a*	b*	DE*	DH*
TYPE I Burgundy Standard		D65	10	30.5	26.0	2.7		
TYPE I Magenta Standard		D65	10	36.3	47.8	7.3		
TYPE I Orange Standard		D65	10	46.5	40.7	25.0		
TYPE I Red Standard		D65	10	37.8	46.2	14.5		
TYPE I Yellow Standard		D65	10	84.0	5.4	85.2		
TYPE I Green Standard		D65	10	83.3	-22.3	53.5		
TYPE I Cyan Standard		D65	10	52.9	-24.5	-29.0		
TYPE I Blue Standard		D65	10	33.9	8.5	-15.8		
TYPE I Black Standard		D65	10	23.0	10.0	-12.5		
TYPE I Lavendar Standard	Water Washed	D65	10	32.5	19.0	-9.9		
TYPE I Burgundy	Water Washed	D65	10	28.1	30.9	1.1	3.4	-1.8
TYPE I Magenta	Water Washed	D65	10	35.8	53.2	9.1	5.9	0.8
TYPE I Orange	Water Washed	D65	10	43.0	49.2	27.7	9.8	-2.0
TYPE I Red	Water Washed	D65	10	37.2	52.8	16.5	6.8	-0.1
TYPE I Yellow	Water Washed	D65	10	84.4	-4.7	88.3	10.8	10.2
TYPE I Green	Water Washed	D65	10	66.2	-42.0	58.8	20.5	14.5
TYPE I Cyan	Water Washed	D65	10	58.3	-34.6	-27.7	11.5	-3.0
TYPE I Blue	Water Washed	D65	10	30.4	10.5	-22.7	5.1	-1.4
TYPE I Black	Water Washed	D65	10	23.1	9.6	-16.4	3.9	-2.8
TYPE I Lavendar	Detergent Washed	D65	10	27.8	22.3	-16.7	6.9	-4.0
TYPE I Burgundy	Detergent Washed	D65	10	33.3	31.2	-7.1	10.3	8.5
TYPE I Magenta	Detergent Washed	D65	10	39.9	50.5	-0.5	9.1	8.0
TYPE I Orange	Detergent Washed	D65	10	46.6	41.7	16.0	9.0	-8.5
TYPE I Red	Detergent Washed	D65	10	40.9	47.9	5.9	9.3	-8.8
TYPE I Yellow	Detergent Washed	D65	10	76.5	-3.2	60.4	27.3	8.4
TYPE I Green	Detergent Washed	D65	10	62.0	-34.5	39.1	18.9	17.9
TYPE I Cyan	Detergent Washed	D65	10	53.7	-29.0	-26.6	5.7	-0.4
TYPE I Blue	Detergent Washed	D65	10	33.6	9.6	-26.3	10.8	-3.2
TYPE I Black	Detergent Washed	D65	10	26.5	9.3	-21.4	9.8	-5.1
TYPE I Lavendar	Steamed	D65	10	32.7	20.5	-20.4	10.6	-7.5
TYPE I Burgundy	Steamed	D65	10	28.2	30.8	6.2	5.9	3.3
TYPE I Magenta	Steamed	D65	10	33.9	52.4	12.4	7.4	4.0
TYPE I Orange	Steamed	D65	10	42.1	46.9	32.8	10.9	3.1
TYPE I Red	Steamed	D65	10	35.6	50.0	19.7	6.8	3.8
TYPE I Yellow	Steamed	D65	10	85.3	1.5	101.8	17.1	4.5
TYPE I Green	Steamed	D65	10	62.7	-31.1	67.9	16.6	2.2
TYPE I Cyan	Steamed	D65	10	51.5	-27.4	-24.3	3.4	-0.9
TYPE I Blue	Steamed	D65	10	28.9	10.8	-16.7	5.5	1.2
TYPE I Black	Steamed	D65	10	21.5	8.3	-11.5	2.8	-0.8
TYPE I Lavendar	Steamed & Washed	D65	10	25.5	22.3	-10.8	7.7	0.8
TYPE I Burgundy	Steamed & Washed	D65	10	27.2	30.6	6.0	0.9	-0.3
TYPE I Magenta	Steamed & Washed	D65	10	34.3	52.5	12.5	0.7	0.2
TYPE I Orange	Steamed & Washed	D65	10	41.6	48.6	34.6	2.8	0.6
TYPE I Red	Steamed & Washed	D65	10	35.2	51.8	21.8	3.0	1.5
TYPE I Yellow	Steamed & Washed	D65	10	85.1	-0.5	100.8	2.1	1.7
TYPE I Green	Steamed & Washed	D65	10	61.8	-35.3	64.7	4.7	4.7
TYPE I Cyan	Steamed & Washed	D65	10	49.9	-29.1	-25.0	2.6	-0.6
TYPE I Blue	Steamed & Washed	D65	10	27.0	10.1	-17.6	2.0	-0.9
TYPE I Black	Steamed & Washed	D65	10	21.8	8.8	-11.7	2.2	-2.1
TYPE I Lavendar	Steamed & Detergent Washed	D65	10	24.9	21.8	-11.2	0.8	-0.8
TYPE I Burgundy	Steamed & Detergent Washed	D65	10	28.9	31.6	4.7	1.7	-1.7
TYPE I Magenta	Steamed & Detergent Washed	D65	10	34.1	52.8	10.0	2.2	-2.2
TYPE I Orange	Steamed & Detergent Washed	D65	10	42.3	47.0	33.3	0.8	0.6
TYPE I Red	Steamed & Detergent Washed	D65	10	35.5	51.5	19.2	1.6	-0.6
TYPE I Yellow	Steamed & Detergent Washed	D65	10	83.2	-1.1	96.4	6.5	2.4
TYPE I Green	Steamed & Detergent Washed	D65	10	62.1	-34.3	65.0	3.7	3.6
TYPE I Cyan	Steamed & Detergent Washed	D65	10	49.3	-27.9	-23.2	2.7	-1.1
TYPE I Blue	Steamed & Detergent Washed	D65	10	27.2	11.1	-17.6	1.7	-0.2
TYPE I Black	Steamed & Detergent Washed	D65	10	20.7	7.2	-11.4	1.5	-0.7
TYPE I Lavendar		D65	10	24.7	22.1	-10.8	0.5	-0.2

9015374 11 110499

			CIE					
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE J Burgundy Standard		D65	10	32.1	24.4	1.2		
TYPE J Magenta Standard		D65	10	38.6	45.3	6.2		
TYPE J Orange Standard		D65	10	48.8	38.2	24.6		
TYPE J Red Standard		D65	10	39.3	48.1	14.3		
TYPE J Yellow Standard		D65	10	84.4	6.0	84.0		
TYPE J Green Standard		D65	10	63.4	-22.3	55.1		
TYPE J Cyan Standard		D65	10	53.1	-23.7	-22.6		
TYPE J Blue Standard		D65	10	35.9	7.0	-15.1		
TYPE J Black Standard		D65	10	24.6	9.8	-13.0		
TYPE J Lavender Standard		D65	10	32.8	19.3	-9.8		
TYPE J Burgundy	Water Washed	D65	10	28.1	27.8	-0.9	5.7	2.1
TYPE J Magenta	Water Washed	D65	10	37.3	54.2	8.5	9.3	1.0
TYPE J Orange	Water Washed	D65	10	44.8	46.0	29.4	11.7	-1.1
TYPE J Red	Water Washed	D65	10	38.4	53.6	17.0	8.0	0.4
TYPE J Yellow	Water Washed	D65	10	85.8	-4.5	91.3	12.8	10.5
TYPE J Green	Water Washed	D65	10	65.1	-39.9	59.4	18.1	13.4
TYPE J Cyan	Water Washed	D65	10	54.3	-31.9	-27.4	9.5	-1.9
TYPE J Blue	Water Washed	D65	10	30.0	9.2	-22.2	8.4	-0.8
TYPE J Black	Water Washed	D65	10	23.3	8.7	-16.0	3.5	-2.6
TYPE J Lavender	Water Washed	D65	10	28.2	21.7	-16.4	8.4	-4.3
TYPE J Burgundy	Detergent Washed	D65	10	27.7	27.5	-0.8	5.8	2.0
TYPE J Magenta	Detergent Washed	D65	10	37.0	53.4	8.3	8.5	0.9
TYPE J Orange	Detergent Washed	D65	10	44.9	47.6	28.7	11.4	-0.7
TYPE J Red	Detergent Washed	D65	10	38.1	52.4	16.8	6.6	-0.4
TYPE J Yellow	Detergent Washed	D65	10	85.0	-4.9	90.5	12.7	11.0
TYPE J Green	Detergent Washed	D65	10	63.7	-40.5	58.2	18.4	14.4
TYPE J Cyan	Detergent Washed	D65	10	54.3	-32.8	-28.2	10.7	-2.0
TYPE J Blue	Detergent Washed	D65	10	30.3	7.8	-22.8	9.5	-2.0
TYPE J Black	Detergent Washed	D65	10	23.3	8.1	-16.3	4.0	-3.2
TYPE J Lavender	Detergent Washed	D65	10	28.7	20.7	-16.5	9.2	-4.9
TYPE J Burgundy	Steamed	D65	10	28.6	28.2	2.8	4.2	1.4
TYPE J Magenta	Steamed	D65	10	38.3	50.3	9.4	6.4	2.3
TYPE J Orange	Steamed	D65	10	45.6	42.1	30.9	8.2	3.0
TYPE J Red	Steamed	D65	10	37.7	48.7	17.5	4.5	2.2
TYPE J Yellow	Steamed	D65	10	86.1	2.9	95.9	12.3	3.7
TYPE J Green	Steamed	D65	10	62.4	-28.2	60.0	6.3	1.7
TYPE J Cyan	Steamed	D65	10	51.1	-25.4	-23.9	2.9	-0.2
TYPE J Blue	Steamed	D65	10	31.6	8.8	-16.5	4.9	1.0
TYPE J Black	Steamed	D65	10	24.5	47.9	-50.7	53.6	3.7
TYPE J Lavender	Steamed	D65	10	28.1	21.4	-10.8	5.3	0.0
TYPE J Burgundy	Steamed & Washed	D65	10	27.015	26.128	2.8414	1.6831	-0.093
TYPE J Magenta	Steamed & Washed	D65	10	35.352	51.387	9.8503	1.8071	0.4909
TYPE J Orange	Steamed & Washed	D65	10	43.223	45.367	32.98	4.284	0.0093
TYPE J Red	Steamed & Washed	D65	10	35.898	50.1	19.95	3.2791	1.6932
TYPE J Yellow	Steamed & Washed	D65	10	84.116	-3.608	95.722	6.7888	6.7237
TYPE J Green	Steamed & Washed	D65	10	61.602	-37.79	59.024	11.5	10.482
TYPE J Cyan	Steamed & Washed	D65	10	50.092	-31.33	-28.14	6.8202	-2.243
TYPE J Blue	Steamed & Washed	D65	10	28.01	7.0013	-19.3	4.9737	-2.619
TYPE J Black	Steamed & Washed	D65	10	22.573	6.26	-13.66	3.097	-2.945
TYPE J Lavender	Steamed & Washed	D65	10	26.273	20.149	-11.85	2.5516	-1.355
TYPE J Burgundy	Steamed & Detergent Washed	D65	10	28.352	27.518	-1.331	4.4231	4.345
TYPE J Magenta	Steamed & Detergent Washed	D65	10	35.35	51.108	5.9685	3.4771	-3.259
TYPE J Orange	Steamed & Detergent Washed	D65	10	43.55	42.812	27.727	3.8087	-2.761
TYPE J Red	Steamed & Detergent Washed	D65	10	36.827	49.178	15.091	2.774	-2.537
TYPE J Yellow	Steamed & Detergent Washed	D65	10	80.671	-5.9	87.42	13.061	9.1517
TYPE J Green	Steamed & Detergent Washed	D65	10	62.404	-39.22	56.422	13.324	12.699
TYPE J Cyan	Steamed & Detergent Washed	D65	10	50.606	-31.84	-25.07	6.8502	-3.297
TYPE J Blue	Steamed & Detergent Washed	D65	10	28.788	7.7006	-20.33	4.8732	-2.412
TYPE J Black	Steamed & Detergent Washed	D65	10	22.858	7.2993	-15.33	3.6173	-2.902
TYPE J Lavender	Steamed & Detergent Washed	D65	10	26.388	20.921	-14.12	3.9062	-3.112

6015741-110499

DK 365
366

				CIE				
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE K Burgundy Standard		D65	10	31.4	29.8	3.2		
TYPE K Magenta Standard		D65	10	38.7	48.8	8.0		
TYPE K Orange Standard		D65	10	46.8	41.2	28.5		
TYPE K Red Standard		D65	10	38.6	46.9	15.1		
TYPE K Yellow Standard		D65	10	83.9	6.8	84.5		
TYPE K Green Standard		D65	10	63.1	-22.5	53.6		
TYPE K Cyan Standard		D65	10	52.2	-23.7	-23.6		
TYPE K Burgundy	Water Washed	D65	10	28.1	29.9	2.2	3.4	-1.6
TYPE K Magenta	Water Washed	D65	10	38.2	53.9	9.9	5.5	1.0
TYPE K Orange	Water Washed	D65	10	44.0	48.5	30.4	8.7	-0.6
TYPE K Red	Water Washed	D65	10	37.4	52.6	18.4	6.7	1.3
TYPE K Yellow	Water Washed	D65	10	86.2	-4.5	93.1	13.4	10.1
TYPE K Green	Water Washed	D65	10	64.1	-39.5	57.3	17.5	13.1
TYPE K Cyan	Water Washed	D65	10	53.7	-32.4	-26.0	9.9	-2.6
TYPE K Burgundy	Detergent Washed	D65	10	27.8	31.2	1.8	4.1	-1.5
TYPE K Magenta	Detergent Washed	D65	10	35.5	52.7	8.9	4.1	0.3
TYPE K Orange	Detergent Washed	D65	10	43.4	46.6	28.4	6.6	-1.3
TYPE K Red	Detergent Washed	D65	10	37.6	51.5	15.9	4.8	-0.6
TYPE K Yellow	Detergent Washed	D65	10	80.1	-0.9	82.2	7.8	6.4
TYPE K Green	Detergent Washed	D65	10	62.1	-35.2	53.3	12.8	11.4
TYPE K Cyan	Detergent Washed	D65	10	52.1	-33.2	-24.4	9.6	-5.6
TYPE K Burgundy	Steamed	D65	10	28.9	30.7	5.9	5.3	2.5
TYPE K Magenta	Steamed	D65	10	34.6	52.3	11.8	5.6	3.1
TYPE K Orange	Steamed	D65	10	42.9	46.2	33.3	9.2	2.7
TYPE K Red	Steamed	D65	10	36.0	50.8	20.1	12.3	11.1
TYPE K Yellow	Steamed	D65	10	85.7	0.9	101.7	17.9	5.4
TYPE K Green	Steamed	D65	10	62.5	-28.8	63.4	11.7	1.9
TYPE K Cyan	Steamed	D65	10	50.8	-25.5	-24.8	2.6	-0.4
TYPE K Burgundy	Steamed & Washed	D65	10	28.21	32.12	5.50	1.93	-0.73
TYPE K Magenta	Steamed & Washed	D65	10	34.39	53.01	11.64	0.87	-0.61
TYPE K Orange	Steamed & Washed	D65	10	42.17	48.01	35.66	1.87	0.37
TYPE K Red	Steamed & Washed	D65	10	35.51	51.82	21.65	1.37	0.87
TYPE K Yellow	Steamed & Washed	D65	10	85.24	-0.88	101.98	2.02	1.92
TYPE K Green	Steamed & Washed	D65	10	62.15	-36.16	63.61	7.85	6.87
TYPE K Cyan	Steamed & Washed	D65	10	48.78	-26.90	-25.48	2.60	-0.61
TYPE K Blue	Steamed & Washed	D65	10	28.17	9.89	-17.45	2.54	-0.18
TYPE K Black	Steamed & Washed	D65	10	22.91	7.85	-12.16	0.96	-0.72
TYPE K Lavender	Steamed & Washed	D65	10	26.50	21.70	-11.35	1.86	-0.61
TYPE K Burgundy	Steamed & Detergent Washed	D65	10	28.00	32.12	5.16	1.92	-1.07
TYPE K Magenta	Steamed & Detergent Washed	D65	10	34.06	52.97	11.39	1.07	-0.84
TYPE K Orange	Steamed & Detergent Washed	D65	10	42.43	47.59	35.01	0.96	-0.07
TYPE K Red	Steamed & Detergent Washed	D65	10	35.61	51.77	20.94	0.87	-0.09
TYPE K Yellow	Steamed & Detergent Washed	D65	10	85.48	-3.18	100.32	4.40	4.29
TYPE K Green	Steamed & Detergent Washed	D65	10	63.46	-37.85	64.60	9.43	7.59
TYPE K Cyan	Steamed & Detergent Washed	D65	10	50.02	-28.48	-25.32	3.30	-1.78
TYPE K Blue	Steamed & Detergent Washed	D65	10	29.29	9.33	-16.05	1.97	-0.91
TYPE K Black	Steamed & Detergent Washed	D65	10	24.66	7.77	-12.64	1.72	-1.05
TYPE K Lavender	Steamed & Detergent Washed	D65	10	27.42	21.87	-12.19	1.92	-1.27

6045374.110499

2 of 7 366

CU367

				CIE				
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
6869-1-2 Acid Blue 6 Nylon/Lycra	Standard	D65	10	59.0	-2.9	-34.9		
6869-1-2 Acid Blue 6 Nylon/Lycra	Steamed	D65	10	48.0	0.1	-49.9	18.9	3.6
6869-1-2 Acid Blue 6 Nylon/Lycra	Steamed&Washed	D65	10	48.3	-0.5	-49.4	18.2	3.1
6869-1-2 Acid Blue 6 Nylon/Lycra	Washed	D65	10	89.0	-4.5	-8.7	39.8	-7.2
6869-1-2 Acid Blue 6 Nylon/Lycra	Steamed Standard	D65	10	48.3	-0.1	-49.7		
6869-1-2 Acid Blue 6 Nylon/Lycra	Steamed&Washed	D65	10	48.5	-0.5	-49.4	0.5	-0.4
6869-1-2 Acid Blue 6 Nylon/Lycra	Washed	D65	10	88.8	-4.8	-9.0	57.6	-10.3
6869-1-2 Acid Blue 6 Silk Charmeuse	Standard	D65	10	56.3	-2.3	-38.4		
6869-1-2 Acid Blue 6 Silk Charmeuse	Steamed	D65	10	51.1	-4.5	-46.7	10.1	-1.5
6869-1-2 Acid Blue 6 Silk Charmeuse	Steamed&Washed	D65	10	51.2	-3.8	-47.0	10.1	-0.8
6869-1-2 Acid Blue 6 Silk Charmeuse	Washed	D65	10	82.8	-7.3	-16.1	35.0	-9.5
6869-1-2 Acid Blue 6 Silk Charmeuse	Steamed Standard	D65	10	50.9	-4.2	-46.8		
6869-1-2 Acid Blue 6 Silk Charmeuse	Steamed&Washed	D65	10	51.9	-4.1	-46.2	1.2	0.1
6869-1-2 Acid Blue 6 Silk Charmeuse	Washed	D65	10	82.6	-7.3	-15.8	44.5	-9.7

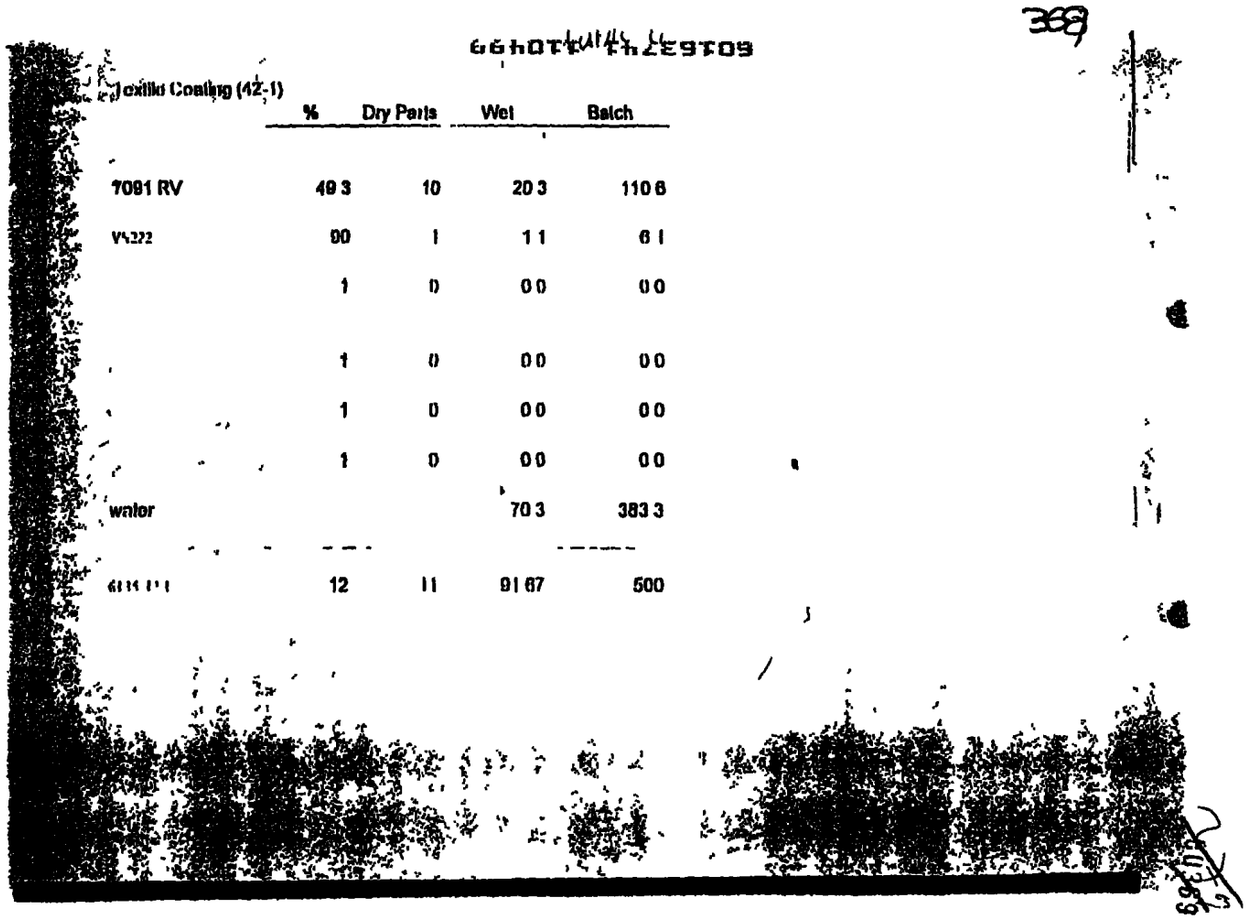
6015374-1 .110H99

367

Name	Color Values L*	a*	b*	C*	h*	DE	DH	Density Measurements Optical Density C	[illegible]	[illegible]	[illegible]	Avg. Density
[illegible] 316	90.9	0.9	-8.5	8.6	270.3	0.3	-0.2	0.1	0.1	0.1	0.1	0.3
[illegible] 315	75.9	5.2	-17.1	17.8	287.0	16.4	-3.3	0.3	0.3	0.3	0.2	0.9
[illegible]	74.0	-1.2	-5.7	5.8	257.6	12.1	6.4	0.4	0.4	0.3	0.5	1.0
[illegible]	70.3	11.2	-12.2	16.6	312.6	13.6	-4.0	0.3	0.3	0.4	0.2	0.9

368

367



Flexible Coating (42-1)

	%	Dry Parts	Wet	Batch
7081 RV	49 3	10	20 3	110 6
V5222	90	1	1 1	6 1
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			70 3	383 3
	12	11	91 67	500

Textile Coating (73B)

	%	Dry Parts	Wet	Batch
7091 RV	49 3	10	20 3	110 6
Acrysol 412	4 44	1	22 5	122 9
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			48 9	266 5
5753 71 B	12	11	91 67	500

66hOTT' TH7E9T09

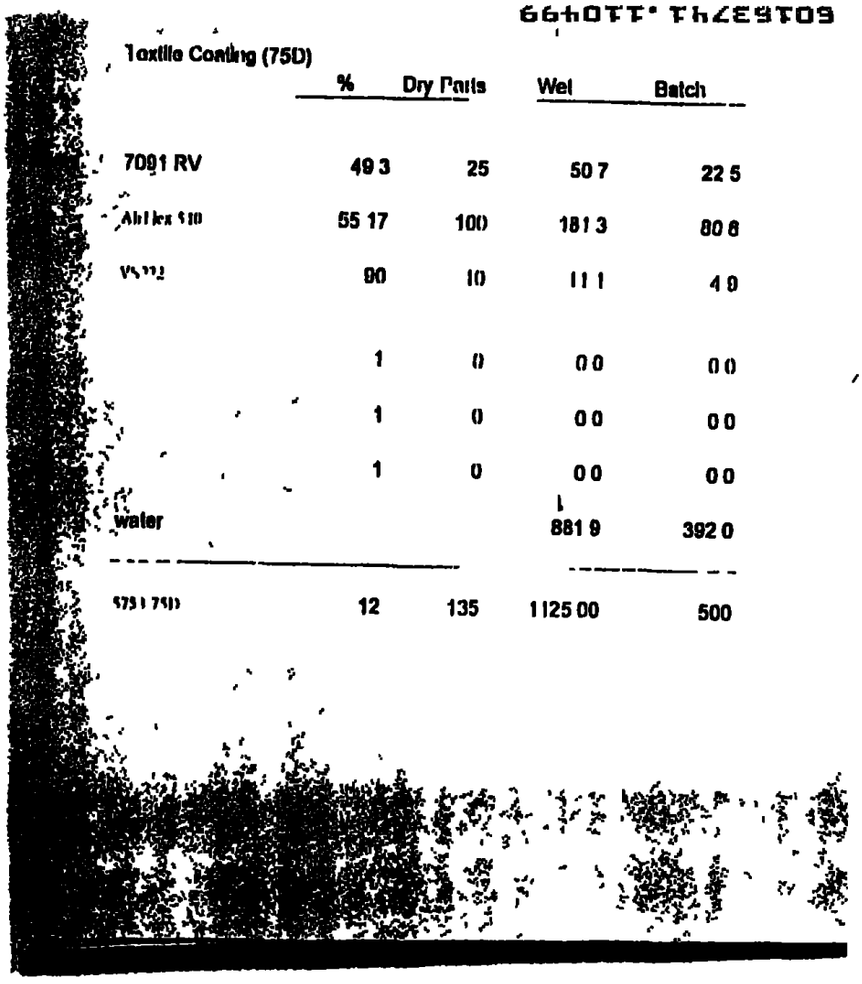
Textile Coating (730)	%	Dry Parts	Wet	Batch
7091 RV	49 3	10	20 3	110 6
Aerosil 150	4 32	1	23 1	126 3
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			48 2	263 1
	12	11	91 07	500

6015374.1 110499

Textile Coating (73D)

	%	Dry Parts	Wet	Batch
7001 RV	40 3	10	20 3	110 6
Aminosoft (Super100)	4 4	1	22 7	124 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
Water			48 7	265 4
	12	11	91 67	500

372



Textile Coating (75D)

	%	Dry Parts	Wet	Batch
7091 RV	49 3	25	50 7	22 5
Airflex 110	55 17	100	181 3	80 6
VS 772	90	10	11 1	4 9
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			881 9	392 0
9751 75D	12	135	1125 00	500

[illegible]		28	50 7	22 5
AirFlex 540	55 17	100	181 3	80 6
Vinyon [illegible]	66 7	10	15 0	6 7
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			876 0	390 2
[illegible]	12	135	1125 00	500

60163741 .110499

			26	157.2
	47	1	21 3	110 1
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			41 6	226 8
	12	11	91 67	500

			Wet	Batch
		10	23 3	126 9
VV132	47	1	21 3	116 1
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
wmlcr			47 1	257 0
1751-86 1	12	11	91 67	500

00377

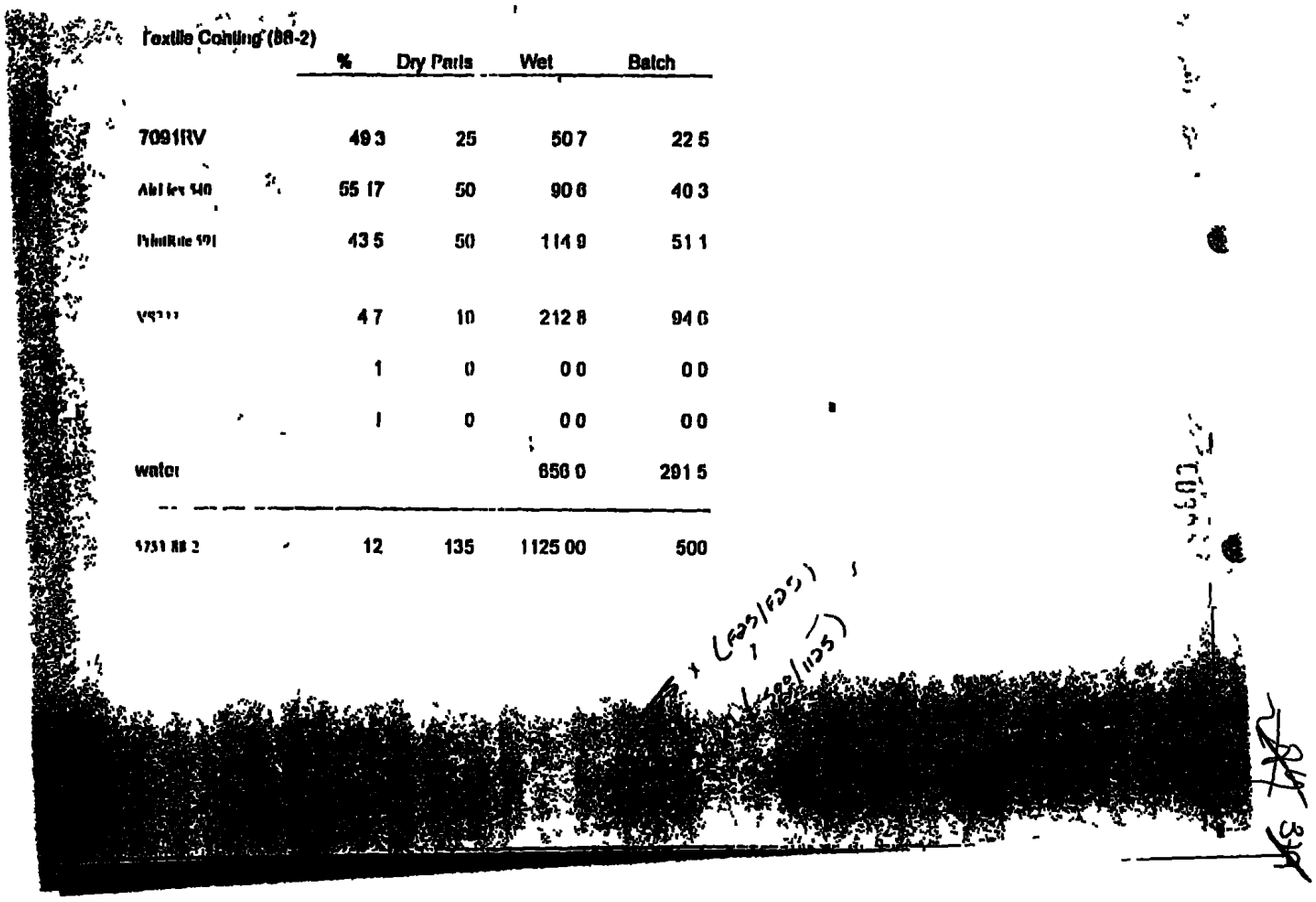
			201	1100
Almond	11	1	0 0	40 3
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
	1	0	0 0	0 0
water			0 2 5	3 4 1
[illegible]	12	11	9 1 6 7	500

Textile Coating (88-1)

	%	Dry Parts	Wet	Batch
709 IRV	49 3	25	50 7	22 5
AbPlex 540	55 17	50	90 6	40 3
PhilRite 595	43 5	50	114 9	51 1
[illegible]	4 7	10	212 8	94 6
	1	0	0 0	0 0
	1	0	0 0	0 0
water			656 0	291 5
[illegible]	12	135	1125 00	500

Textile Coating (88-2)

	%	Dry Parts	Wet	Batch
7091RV	49 3	25	50 7	22 5
Ab l ev 540	55 17	50	90 6	40 3
PrintRite 191	43 5	50	114 9	51 1
V9211	4 7	10	212 8	94 6
	1	0	0 0	0 0
	1	0	0 0	0 0
water			656 0	291 5
9751 88 2	12	135	1125 00	500



Textile Coating (88-3)

	%	Dry Parts	Wet	Batch
7091RV	49 3	5	10 1	55 3
	1	0	0 0	0 0
PrintRite 591	43 5	5	11 5	62 7
V5713	4 7	1	21 3	116 1
	1	0	0 0	0 0
	1	0	0 0	0 0
water			40 8	205 9
5751 88 1	12	11	91 07	500

6614011 T4Z6STO9

Textile Coating (88-4)

	%	Dry Parts	Wet	Batch
7091RV	49 3	5	10 1	55 3
	1	0	0 0	0 0
[illegible]	43 5	4	11 5	62 7
[illegible]	4 7	1	21 3	116 1
	1	0	0 0	0 0
	1	0	0 0	0 0
water			48 8	265 9
[illegible]	12	11	91 07	500

08531

Textile Coating (88-5)

	%	Dry Parts	Wet	Batch
7001RV	40 3	5	10 1	55 3
	1	0	0 0	0 0
Ab1ex 540	55 17	5	9 1	49 4
[illegible]	4 7	1	21 1	110 1
	1	0	0 0	0 0
	1	0	0 0	0 0
water			51 2	279 2
[illegible]	12	11	91 07	500

Textile Coating (81 5)

	%	Dry Parts	Wet	Batch
7091RV (Catalyst)	49 1	25	50 7	14 5
	1	0	0 0	0 0
PrintRite 491	43 1	100	230 9	66 0
VS125	6 75	20	296 3	84 7
	1	0	0 0	0 0
	1	0	0 0	0 0
water			993 5	283 9
[illegible]	7	110	1571 43	449

SILK CHARMEUSE
DRY CLEANING TESTS

	330	129	12	130	3540			10	12	0.1	1.0
Magenta	489	548	52	551	3546			07	12	0.4	0.8
Orange	475	513	350	621	343			06	12	0.3	1.3
Red	451	521	273	588	276			07	12	0.4	1.2
Black	295	18	05	19	140			12	12	1.2	1.2
Yellow	810	50	018	920	809			01	02	0.1	1.1
Green	557	351	451	571	1279			06	05	09	1.1
Cyan	618	279	312	419	2282			07	04	10	0.2
Blue	341	119	251	278	2954			11	12	11	0.8
Black 2	101	41	60	79	3031			12	12	12	1.1
Lavender	111	190	277	136	3087			11	12	10	0.8
FABRITE 88-2 DRY CLEAN #1											
Burgundy	305	117	16	118	3525	36	05	12	13	10	1.2
Magenta	447	546	50	548	3546	23	02	07	12	0.4	0.8
Orange	452	501	345	608	346	26	03	07	12	0.3	1.3
Red	430	513	272	581	279	21	03	07	13	09	1.3
Black 1	277	11	01	15	1480	20	07	13	13	13	0.1
Yellow	821	17	903	905	870	19	02	02	02	01	1.1
Green	542	151	442	506	1286	11	07	07	05	09	0.2
Cyan	608	285	208	412	2263	16	14	07	04	10	0.3
Blue	137	113	248	273	2945	08	04	11	12	11	0.8
Black 2	289	16	69	78	2980	14	07	12	13	12	1.1
Lavender	111	190	277	136	3048	11	08	12	13	11	0.8
91-4											
Burgundy	319	137	20	139	3516			10	12	09	1.1
Magenta	486	547	60	550	3537			07	12	0.4	0.8
Orange	476	507	347	614	344			06	11	0.3	1.3
Red	453	517	259	578	286			07	12	0.3	1.2
Black 1	115	16	03	16	114			11	11	11	1.1
Yellow	816	48	906	907	870			01	02	01	1.1
Green	577	350	444	505	1282			06	04	08	1.1
Cyan	611	291	301	420	2281			06	04	10	0.2

58000

SILK CHARMFUSE DRY CLEANING TESTS

		291.0			298.4						
		3.8	-7.2	-8.2	298.4						
Lavender	344	192	-27.6	33.6	304.8						
91-4L DRY CLEAN											
Burgundy	372	125	23	127	348.6	22	-0.6	1.1	1.2	1.0	1.1
Magenta	459	538	5.6	54.1	354.0	1.3	0.3	0.7	1.2	0.4	0.8
Orange	107	409	34.3	60.5	34.6	1.3	0.1	0.7	1.2	0.3	1.3
Red	440	505	25.4	56.5	26.7	1.8	0.2	0.7	1.2	0.4	1.2
Black 1	268	1.3	0.0	1.3	359.8	2.6	0.3	1.2	1.2	1.2	1.2
Yellow	81.1	1.2	86.0	86.0	87.9	5.6	1.3	0.2	0.2	0.1	1.1
Green	46.1	11.7	43.3	55.4	128.7	1.8	0.5	0.6	0.6	0.9	1.1
Cyan	61.6	20.4	-27.5	40.1	223.1	1.2	2.2	0.6	0.4	1.0	0.3
Blue	353	104	24.9	27.0	202.8	1.5	0.3	1.1	1.1	1.1	0.6
Black 2	285	3.6	-0.7	7.6	295.1	2.2	0.0	1.2	1.2	1.2	1.1
Lavender	317	191	27.0	33.1	305.3	0.9	0.3	1.1	1.2	1.0	0.8
91-4H											
Burgundy	316	130	2.1	13.8	351.1			1.1	1.2	1.0	1.1
Magenta	459	561	5.5	56.4	354.4			0.7	1.2	0.4	0.8
Orange	470	518	35.8	63.0	34.7			0.6	1.2	0.3	1.3
Red	417	523	27.0	58.9	27.3			0.7	1.2	0.4	1.2
Black 1	298	1.8	0.1	1.8	3.8			1.2	1.2	1.2	1.2
Yellow	84.6	4.8	92.6	92.8	87.1			0.1	0.2	0.1	1.1
Green	47.1	11.5	40.2	50.7	127.5			0.0	0.5	0.9	1.1
Cyan	63.0	20.8	30.4	42.5	225.8			0.6	0.4	1.0	0.2
Blue	362	11.8	26.2	28.7	204.2			1.1	1.1	1.0	0.7
Black 2	297	4.1	6.9	8.0	300.5			1.2	1.2	1.2	1.1
Lavender	316	203	28.0	34.6	305.0			1.1	1.2	1.0	0.8
91-4H DRY CLEAN											
Burgundy	291	123	2.2	12.6	349.0	2.6	0.3	1.2	1.3	1.1	1.2
Magenta	417	558	4.9	58.0	355.0	1.4	0.6	0.7	1.3	0.4	0.8
Orange	152	501	35.1	61.7	34.7	2.2	0.1	0.7	1.2	0.4	1.4
Red	112	525	27.0	60.4	28.0	1.8	0.7	0.7	1.1	0.4	1.3

60163741 110499

98607

SILKSCI ARMEUSL
DRY CLEANING TESTS

Khaki	511	350	449	570	1280	25	04	07	0.5	0.6	1.2
Cyan	600	290	276	405	223 2	30	19	07	0.2	1.0	0.3
Blue	329	119	-255	281	295 0	24	0.4	1.2	1.2	1.1	0.8
Black 2	273	40	-65	76	301 7	25	02	1.3	1.3	1.3	1.2
Lavender	320	200	-277	341	305 0	16	00	1.2	1.3	1.0	0.8
91-1											
Burgundy	443	236	79	249	341 5			0.6	1.0	0.6	0.6
Magenta	487	301	183	354	1289			0.5	0.7	0.4	0.4
Orange	401	357	266	445	360			0.5	0.8	0.3	0.9
Red	536	415	100	427	135			0.6	0.9	0.9	0.8
Black 1	299	18	07	19	20.8			1.2	1.2	1.2	1.2
Yellow	824	100	647	655	988			0.2	0.2	0.2	0.8
Green	714	278	444	524	1220			0.4	0.3	0.6	0.8
Cyan	000	322	-60	329	1916			0.5	0.3	0.7	0.3
Blue	517	20	-305	306	274 9			0.6	0.7	0.6	0.4
Black 2	357	36	119	125	287 5			1.1	1.1	1.0	0.9
Lavender	467	100	286	315	280 3			0.8	0.8	0.8	0.5
91-1 DRY CLEAN											
Burgundy	415	211	-72	253	343 4	10	08	0.8	1.0	0.8	0.8
Magenta	578	298	159	338	332 0	20	19	0.6	0.7	0.4	0.5
Orange	556	346	206	436	370	12	07	0.5	0.8	0.3	0.9
Red	528	404	97	417	135	1.3	0.0	0.6	0.9	0.3	0.8
Black 1	294	15	06	16	21 1	06	00	1.2	1.2	1.2	1.2
Yellow	804	08	627	632	972	30	19	02	0.2	0.2	0.8
Green	709	240	442	503	1185	36	-32	0.4	0.3	0.6	0.6
Cyan	685	304	68	306	1909	23	-0.4	0.5	0.3	0.7	0.3
Blue	517	151	263	284	273 0	24	-10	0.6	0.7	0.8	0.4
Black 2	352	40	113	120	289 7	09	06	1.1	1.1	1.0	0.9
Lavender	476	111	282	301	291 6	18	07	0.8	0.8	0.8	0.5

60163741.110499

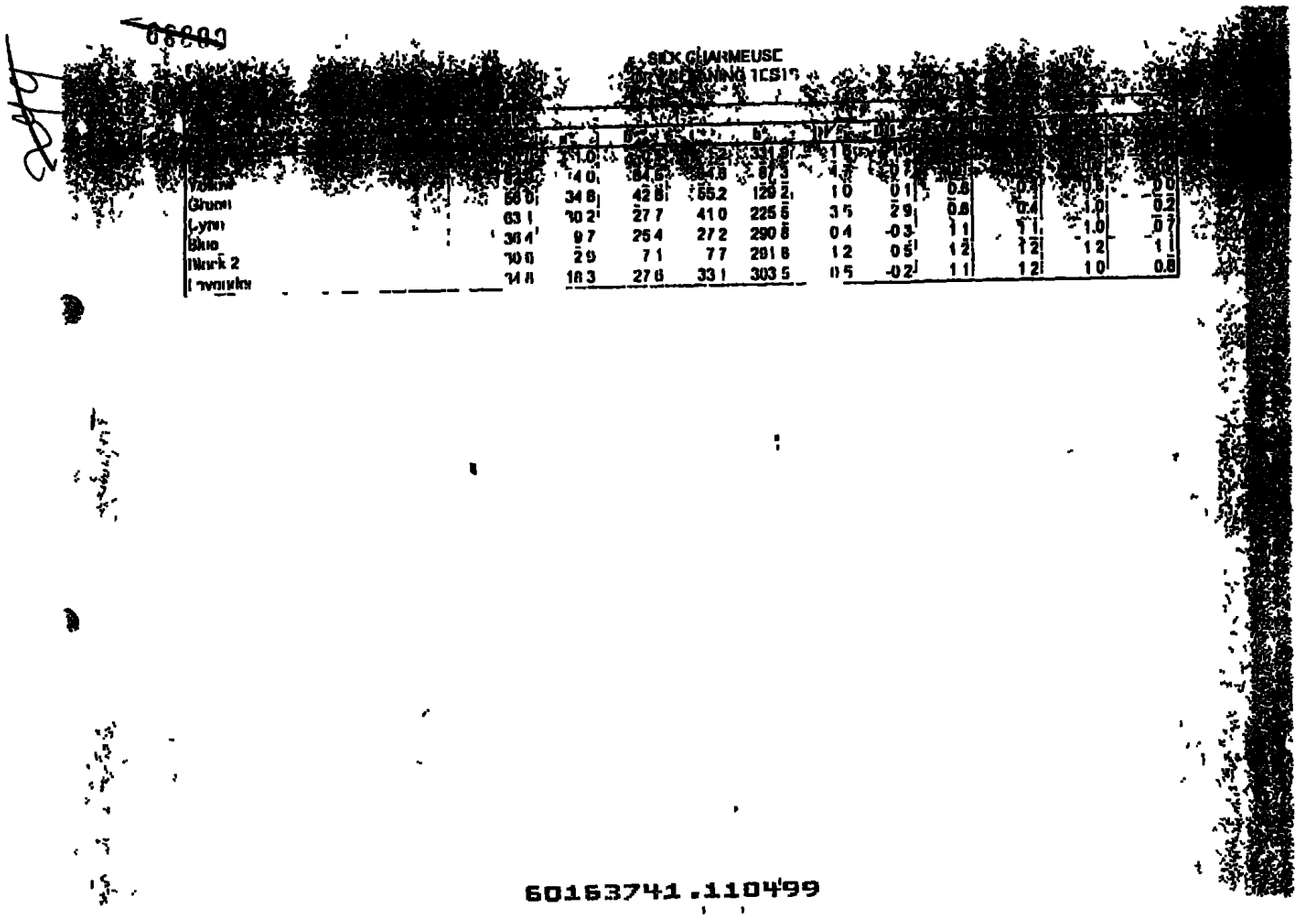
Page 1

Magenta	570	311	164	361	3285			0.8	1.0	0.4	0.6
Orange	551	306	271	455	366			0.5	0.8	0.3	1.0
Red	523	427	108	441	141			0.6	0.9	0.3	0.8
Black 1	287	16	05	17	191			1.2	1.3	1.2	1.3
Yellow	816	09	001	009	985			0.2	0.2	0.2	0.8
Green	705	283	450	532	1222			0.4	0.3	0.5	0.8
Cyan	681	338	70	345	1917			0.5	0.3	0.7	0.3
Blue	493	33	316	318	2760			0.8	0.7	0.9	0.6
Black 2	314	36	118	124	2868			1.1	1.1	1.1	1.0
Lavender	461	116	301	323	2910			0.8	0.8	0.8	0.6
91-2 DRY CLEAN											
Burgundy	417	237	75	249	3424	11	01	0.8	1.0	0.6	0.8
Magenta	572	208	170	343	3303	19	05	0.6	0.7	0.4	0.5
Orange	554	353	264	440	308	15	02	0.5	0.8	0.3	0.9
Red	527	409	103	421	142	20	00	0.8	0.9	0.3	0.8
Black 1	286	14	08	16	302	09	03	1.2	1.2	1.2	1.2
Yellow	801	88	022	029	981	44	05	0.2	0.2	0.2	0.8
Green	608	285	429	504	1217	28	05	0.4	0.3	0.5	0.8
Cyan	675	315	60	320	1907	26	06	0.5	0.3	0.7	0.4
Blue	501	21	300	298	2744	23	08	0.8	0.7	0.8	0.4
Black 2	311	42	108	116	2911	15	09	1.1	1.1	1.1	0.9
Lavender	471	112	287	308	2914	16	02	0.8	0.8	0.8	0.5
91 3											
Burgundy	447	233	73	244	3420			0.8	1.0	0.6	0.8
Magenta	590	284	172	341	3298			0.5	0.7	0.4	0.4
Orange	555	358	255	439	355			0.5	0.8	0.3	0.3
Red	533	409	95	420	131			0.6	0.9	0.3	0.8
Black 1	301	24	08	25	130			1.2	1.2	1.2	1.2
Yellow	817	85	032	038	976			0.2	0.2	0.2	0.8
Green	712	259	427	500	1212			0.4	0.3	0.5	0.8
Cyan	668	300	63	316	1016			0.5	0.3	0.7	0.3

60163741 .110499

SILK CHARMEUSE
HIGH CLEANING EFFICIENCY

		9.4	330.3	20.6	276.5						
		4.8	10.5	11.5	294.8						
Lavender	48.4	11.7	-28.9	31.2	297.0			0.8	0.7	0.8	0.5
91-3 DRY CLEAN											
Burgundy	41.1	23.4	7.9	24.0	341.4	0.8	0.5	0.8	1.0	0.8	0.8
Magenta	67.8	28.7	16.0	12.8	130.8	1.0	0.7	0.5	0.7	0.4	0.5
Orange	54.8	15.0	24.3	42.0	34.7	1.5	0.0	0.6	0.8	0.3	0.9
Red	52.0	39.8	9.2	40.8	13.0	1.3	-0.1	0.6	0.9	0.3	0.8
Black 1	30.1	2.2	0.3	2.2	7.3	0.5	-0.3	1.2	1.2	1.1	1.2
Yellow	80.2	9.0	60.4	61.1	98.5	3.3	0.9	0.2	0.2	0.2	0.8
Green	69.7	26.0	41.4	48.9	12.1	2.1	0.8	0.4	0.3	0.5	0.8
Cyan	68.1	10.6	5.7	31.2	190.8	1.8	0.5	0.5	0.3	0.7	0.9
Blue	50.2	3.1	28.0	28.8	270.2	2.1	-0.2	0.8	0.7	0.8	0.5
Black 2	34.2	5.1	11.3	12.4	294.2	1.4	-0.1	1.1	1.1	1.1	1.0
Lavender	47.7	11.4	26.2	30.4	292.0	1.4	0.0	0.8	0.8	0.8	0.5
91-5L											
Burgundy	74.1	13.6	2.1	13.8	351.3			1.0	1.2	0.9	1.0
Magenta	48.8	54.1	5.5	54.3	354.2			0.7	1.2	0.4	0.8
Orange	17.8	10.9	33.5	60.1	33.9			0.6	1.1	0.3	1.2
Red	49.1	50.9	24.9	50.7	28.1			0.7	1.2	0.4	1.2
Black 1	31.1	1.4	0.4	1.5	17.1			1.1	1.2	1.1	1.2
Yellow	81.6	4.8	88.8	88.9	89.9			0.1	0.2	0.1	1.1
Green	57.6	34.9	42.7	55.1	12.2			0.6	0.4	0.8	1.1
Cyan	62.8	29.5	31.1	42.8	226.5			0.8	0.4	1.0	0.2
Blue	30.1	10.1	25.5	27.4	291.5			1.1	1.1	1.0	0.7
Black 2	31.0	3.3	0.8	7.0	295.8			1.1	1.2	1.1	1.0
Lavender	14.6	18.3	-27.1	32.7	303.9			1.1	1.2	1.0	0.8
91-5L DRY CLEAN											
Burgundy	11.2	11.6	2.9	11.9	345.8	2.4	1.2	1.1	1.2	1.0	1.1
Magenta	47.6	52.5	7.6	53.0	351.7	2.8	2.3	0.7	1.1	0.4	0.7
Orange	48.6	48.6	33.2	57.2	35.5	3.4	1.7	0.8	1.1	0.3	1.2
Red	18.1	48.1	24.0	53.8	28.6	1.1	0.4	0.7	1.2	0.4	1.1



SIDX CHARMEUSE

			1.0			331						
			140									
Ghent		556	348	428	552	129 2	10	01	0.8	0.4	1.0	0.2
Lyon		631	302	277	410	225 6	35	29	0.8	0.4	1.0	0.2
Blue		364	97	254	272	290 8	04	-03	1 1	1 1	1.0	0.7
Mark 2		100	29	71	77	281 8	12	05	1 2	1 2	1 2	1
Lavender		148	183	276	331	303 5	05	-02	1 1	1 2	1 0	0.8

60163741.110499

COMPLETE 8

POLY SATIN

		14 6		31.8	297.5							
Black 1	42 4	5.2	-5 0	5.8	302 4			0.9	0 9	0.9		
Blue	66 6	6 1	-25 2	26.7	281.4			0.2	0 6	0 7		
Cyan	70 9	-19 3	-31 9	37.3	238 0			0.5	0.3	0 7		
Green	73 6	-31 6	29 9	43 5	130 7			0.4	0.2	0.5		
Yellow	91 4	-9 9	59.8	60 6	90 4			0 1	0 1	0 1		
Black 2	38 5	1 3	1 3	1 9	44.8			1.0	1.0	0 9		
Red	63 6	33 9	13 9	36 7	22.3			0.4	0 7	0.2		
Orange	66.5	28 2	24.8	37 5	41 3			0.4	0.6	0 2		
Magenta	64 6	41 8	14 0	44 0	141 6			0 4	0 7	0.2		
Brown	40 0	11 8	1 8	11 9	352 5			0 7	0.8	0.6		
Neutral	9.7	1 0	5 0	5.1	280 9			0.1	0 0	0 1		
FR POLY SATIN DOUBLE STRIKE												
Lavender	40 3	16 3	-33 1	36 9	296 3			0.9	0 9	0 8		
Black 1	29 7	3 2	1 1	3.4	341 4			1.2	1 2	1.2		
Blue	44 4	5 3	-24 4	25 0	282 2			0 9	0 9	0 9		
Cyan	65 1	22 5	-37 1	43.4	236 8			0.8	0.4	0 8		
Green	67 3	-40 1	35 2	53 4	138 7			0.5	0.3	0 7		
Yellow	90 2	10 2	72 4	73 2	98 0			0 1	0 1	0 1		
Black 2	29 1	1 2	2 1	2 4	59 8			1.3	1 3	1.2		
Red	50 5	40 9	20 9	45.9	27 1			0.5	0.9	0 2		
Orange	59 5	36 9	31 8	48 7	40 8			0 5	0.8	0.2		
Magenta	58 2	49 6	14 3	51 7	341 9			0 5	0.8	0 2		
Brown	35 8	7 0	1 0	8 0	7 4			1 0	1 1	1 0		
Neutral	9.2	0 8	4 4	4 5	280 9			0 1	0 1	0 1		
FR POLY SATIN SINGLE STRIKE												
102 LIGHT 16 MIN SPRAY INITIAL 2 HRS												
Lavender	58 5	12 6	-26 0	29 0	296 3	4 3	-0 8	0.8	0.6	0 5	0.4	
Black 1	45 6	3 2	-4 9	5 9	302 6	3 2	0 0	0 8	0.8	0 8	0 8	
Blue	59 6	3 7	23 3	23 6	279 0	4 6	-1 1	0 6	0 6	0 6	0.4	
Cyan	72 1	18 7	-29.6	35.0	237 8	2 6	-0 7	0 4	0 5	0 6	0 1	
Green	70 7	-23 6	17 2	29.3	144 1	16 0	4 6	0 3	0.2	0 3	0.4	

60163741 .110499

Page 1

66h0TT' Th7E9T09

POLY SATIN

	Color Values										
Fabric Type	L*	a*	b*	C*	h*	DK	DH	V	M	C	Y
Yellow	91 7	-9.0	46.2	47 1	101 1	13.8	1 6	0 1	0 1	0 1	0.4
Black 2	42 9	1.4	0.8	1 6	31 1	4.5	-0.4	0 0	0 0	0 0	0 0
Red	64 8	31.2	12.3	33 5	21 6	3.4	-0 5	0.4	0 6	0 2	0 6
Orange	67 3	26 3	22.6	34 8	41 0	2.8	-0 2	0 4	0 6	0.2	0 6
Magenta	65 1	39 6	-15 9	42 2	340 2	2.0	-0 5	0 4	0 6	0 2	0 4
Brown	50 5	11 4	1 9	11 6	350 8	1 6	0 3	0 7	0 6	0 6	0 7
Neutral	0[illegible]	1 1	5 3	5 5	281 6	0 5	0 1	0 1	0 1	0 1	0 0
FR POLY SATIN DOUBLE STRIKE 102 LIGHT 16 MIN SPRAY - INITIAL 2 HRS											
Lavender	50 0	13 6	-30 6	33 6	294 2	5 1	1 3	0 6	0 6	0 7	0 5
Black 1	34 2	2 0	-0.8	3 0	344 3	0 1	-0 3	1 1	1 1	1 1	1 1
Blue	46 9	4 6	-22 9	23 4	281 5	3 0	-0 2	0 6	0.6	0.6	0.6
Cyan	65 8	-21 9	-33 6	40 3	237.0	3 6	1 3	0 6	0 4	0.6	0 2
Green	76 3	-29 1	14.2	32 3	154 1	26.5	11 1	0.3	0 2	0.5	0.4
Yellow	89 1	-0 1	36 6	40.8	102 6	32 7	4 6	0.1	0 1	0 1	0.4
Black 2	32 8	1 5	3 0	3 4	62 9	5.8	0.2	1.2	1.2	1 1	1.2
Red	57 2	39 0	20 5	44 1	27 6	2 1	0 5	0 5	0 6	0.2	0 6
Orange	60 1	35 2	31 0	46 9	41 4	2.0	0 5	0 5	0 6	0 2	0 6
Magenta	58 0	48 0	14 2	50 1	343 5	1 7	-0 4	0 5	0 6	0 2	0 5
Brown	38 4	7 4	0 9	7 4	6 0	2.8	-0 1	1.0	1 1	0 9	1 0
Neutral	91 6	1 1	-0 5	5 0	282.8	0 7	0 2	0 1	0 1	0 1	0 0
FR POLY SATIN SINGLE STRIKE 102 LIGHT 16 MIN SPRAY - 4 HRS											
Lavender	62 8	11 4	-23 6	26 2	295 9	9 3	-0 9	0 5	0 5	0 5	0 3
Black 1	40 1	2 9	-4 8	5 6	301 5	3 7	-0 1	0.8	0.8	0 8	0 8
Blue	62 9	3 4	-20 6	21 2	279 4	6 6	-0.8	0 5	0 5	0 6	0 3
Cyan	73.8	-17 5	-28.0	33.0	237 6	5.1	-0.6	0.4	0.3	0 6	0.1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

66hOTT" Th/E9T09

POLY SATIN

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	DH	V	M	C'	Y
Brown	50 3	11 5	-1 7	11 6	351 5	24 9	19.8	0 7	0 8	0 6	0 7
Neutral	94 9	1 1	-6 1	6.2	282 6	0 8	0 16	0 1	0 1	0 1	0.0
FR POLY SATIN DOUBLE STRIKE 101 LIGHT 18 MIN SPRAY - 4 HRS											
Lavender	81.3	13.0	-25 9	32 6	293 5	8.8	-1 7	0 7	0 7	0 7	0.4
Black 1	34 5	2.9	-0 8	3 0	344 4	4.8	0 2	1.0	1 1	1 0	1 1
Blue	47 7	4.3	-22.2	22 6	281 0	4.2	-0 5	0 8	0 8	0 8	0 5
Cyan	70 1	15.4	-25 6	35 4	236 8	9.8	-1.4	0 5	0.3	0 7	0 1
Green	83 8	-20 6	7.6	22.0	159 8	37 3	12.5	0 2	0 1	0 3	0 2
Yellow	92 0	-8.5	30.7	31 8	105 2	41.8	6.0	0 1	0 1	0 1	0 3
Black 2	27 8	1.2	2.3	2 6	62 9	1 4	0 1	1 2	1.3	1 2	1 3
Red	54 5	36 1	21.0	44 4	26 2	2 6	0.8	0 5	0 9	0 3	0 9
Orange	54 8	38 7	20.8	44 0	28 3	12 1	10 1	0 5	0 9	0 3	0.9
Magenta	58 3	48.3	14.4	50 4	343 5	2.3	-0.4	0 6	0 9	0 3	0 6
Brown	38.8	7 5	0 6	7 5	4 9	3 1	-0.3	1 0	1 0	0 9	1 0
Neutral	93 4	1 1	-4 8	4 9	283 0	0 6	0.2	0 1	0 1	0 1	0.1
FR POLY SATIN SINGLE STRIKE 102 LIGHT 18 MIN SPRAY - 8 HRS											
Lavender	83 0	11 0	23 5	26 2	298 1	9 4	-0 84	0 5	0 5	0 5	0 3
Black 1	46 6	3 0	-4.4	5 3	304 6	4.2	0.21	0 8	0 8	0 8	0 8
Blue	63 5	2 9	-20 5	20 7	277 9	9.4	-1.42	0 6	0 5	0 6	0.3
Cyan	74.2	16.5	27 2	32.0	238 3	6.3	-0 39	0 4	0 3	0 6	0 1
Green	85 4	16 7	11.4	20.2	145.8	28.4	4 71	0.2	0 1	0 3	0 5
Yellow	91 8	-7 5	33.1	33 9	102 6	26.8	2 66	0 1	0 1	0 1	0.3
Black 2	45 3	1.4	0 9	1 6	31 6	6.9	-0.41	0.8	0.8	0 8	0 9
Red	65 2	29 7	13 1	32 5	23 9	4 8	0.82	0 4	0 6	0 2	0 6
Orange	67.8	25 7	23.0	34 2	42 2	5 5	0.54	0.4	0.6	0.2	0 6
Magenta	65.7	38 4	13 1	40 5	341 2	3 7	-0.21	0.4	0.6	0.2	0.5
Brown	39.1	11.4	1.7	11 6	351.3						
Neutral	93.0	1.2	-5.1	5.2	284 9						

Page 1

C0392

POLY SATIN

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	DH	V	M	C	Y
Lavender	62 3	12 3	-29.3	31 7	292 6	6.2	-2.07	0 7	0 7	0 7	0 4
Black 1	35 9	2 7	-0.8	2 8	343 3	6.2	0 11	1 0	1 1	1 0	1 0
Blue	48 2	4 3	-22 5	23 0	280 8	4.4	-0 57	0 8	0 8	0 8	0 5
Cyan	71 2	18 4	-27.5	33 1	236 1	12 1	-1 78	0.4	0.3	0.6	0 1
Green	83 6	18 3	7.8	19 9	166 9	38 7	10.24	0 2	0 1	0 3	0 2
Yellow	90 2	7 3	27 2	28 2	105 1	45.3	5 66	0 1	0 1	0 1	0.3
Black 2	31 1	1 3	2 9	3 1	65 3	2 1	0 28	1.2	1.2	1 2	1 2
Red	55 2	37 6	19 5	42.5	27.8	3 7	0 61	0 5	0 9	0.3	0.8
Orange	57 8	35.0	31 1	46 8	41 6	2 7	0 69	0 5	0 8	0.2	0 9
Magenta	56 3	47 6	14 1	49 6	343 5	2 9	-0 32	0 5	0 9	0 3	0 5
Brown	39 0	7 5	0 7	7 5	5 5	5 2	-0 29	1 0	1 0	0 9	1 0
Medium	64 2	1 1	-5 2	5 3	282 3	1 3	0 13	0 1	0 1	0 1	0 0

393

POLY POPLIN

Fabric Type	Color Values L*	a*	b*	C*	h°	DE	YI	V	M	C	Y
FR POLY POPLIN SINGLE STRIKE											
Lavender	50 0	14 9	-30.4	33 9	296 0			0 8	0 8	0 7	0.6
Black 1	38 9	2 5	-6 1	6.6	292 0			1.0	1 0	1 0	0 9
Blue	49 7	5 2	-28 1	28 6	280 6			0.8	0 7	0 8	0.6
Cyan	66 3	-21 2	-37 5	43 0	240.5			0 6	0 4	0 6	0.1
Green	07 3	35 3	32.0	47 6	137.8			0.4	0 3	0 6	0.6
Yellow	80 7	9 2	67 4	68 0	97.8			0 1	0 1	0 1	0.0
Black 2	36 0	1 2	0 7	1.4	29 0			1 1	1 1	1 1	1 1
Red	59 3	36 1	17 8	40 2	26 2			0 5	0 8	0 2	0 7
Orange	61 1	33 5	28 2	43 8	40 1			0 4	0 7	0 2	0.6
Magenta	59 5	45 7	-14 0	47 8	343 0			0 5	0 8	0 2	0.5
Brown	43 7	11 5	-2 1	11 7	349 8			0 9	0 0	0 8	0 9
Neutral	84 9	0 5	-6.2	6 2	274 8			0 1	0 1	0 1	0.0
FR POLY POPLIN DOUBLE STRIKE											
Lavender	38 3	15.9	-31 0	34 8	297.2			1 0	1 1	1.0	0.7
Black 1	27 6	2.3	-3.4	4 1	304.2			1.2	1 3	1.2	0.9
Blue	37 6	6 1	-27.0	27 7	282.8			1 1	1.0	1 1	0.6
Cyan	57 9	-21 0	-41.8	46.5	243 2			0 7	0 5	1 1	0.1
Green	80 2	-41 0	31.5	51 7	142.4			0 6	0.4	0 6	0.0
Yellow	88 0	7 7	76.8	79 2	95 6			0 1	0 1	0.1	0.2
Black 2	25 9	0 9	1.2	1 4	53.5			1 3	1 3	1.3	1.4
Red	49 9	45 9	22 2	50.9	25 8			0 6	1 0	0.3	1.0
Orange	52 8	42 6	31 4	53 1	36 2			0.6	0.9	0 3	1.0
Magenta	51 8	51 8	-10 1	52 6	348 9			0.6	1 0	0 3	0.8
Brown	32 3	8 6	-0 7	8 6	355 7			1 1	1 2	1 0	1.2
Neutral	94 7	0 0	-8 1	8 1	275.3			0 1	0 1	0 1	0.0
FR POLY POPLIN SINGLE STRIKE											
LIGHT 18 MM SPRAY, INITIAL 3 HRS	61.0	13.6	-25.8	33.7							
		2			6						
		3 9		27							
	60 4	-20 7	-31 7	39.8							
	1 4	-33.2	-30.0	42 7	14						

Page 1

00394

394

POLY POPLIN

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH	V	M	C	Y
Yellow	90 0	-9 2	63 6	64.4	98.2	3.6	0 6	0 1	0.1	0 1	0.6
Black 2	37 1	1.2	0.1	1 2	2 8	1.3	-0.8	1.0	1.0	1.0	1.0
Red	60 0	34.3	17 0	38 3	26.3	2 1	0.1	0 5	0.7	0 2	0.5
Orange	61 6	32.2	27 0	42 0	39 9	1.8	-0 1	0.4	0.7	0.2	0.5
Magenta	59 9	44.5	-14 0	46 6	342 5	1.3	-0.4	0.8	0.8	0 2	0.5
Brown	44 8	11.4	-2.0	11 6	350 0	1 1	0.0	0.8	0.9	0 7	0.8
Neutral	94 9	0.8	6.8	6 6	275 4	0 4	0 1	0 1	0.1	0 1	0.0
FR POLY POPLIN DOUBLE STRIKE											
102 LIGHT 18 MIN SPRAY - INITIAL 2 HRS											
Lavender	39 4	14 7	-31 5	34 7	295 1	1 7	-1.3	1 0	1.0	1.0	0.8
Black 1	28 7	2 1	3 4	4 0	301 8	1 1	-0.2	1 2	1.2	1 2	1.2
Blue	40 1	4 0	25 8	26 1	278 7	3.4	-1 8	1 0	1.0	1.0	0.7
Cyan	50 3	-21 9	-39 2	44 9	240 8	2.8	-1 9	0 7	0.5	1 0	0.2
Green	65.2	-39 7	24 8	44 3	145 9	9 4	2.9	0.6	0.2	0 7	0.6
Yellow	89 1	-5 [illegible]	70.9	71 4	95 6	7.9	1 3	0 1	0 1	0 1	0.7
Black 2	27 7	1 0	0.8	1.3	40 5	1 9	-0 3	1.2	1.2	1.2	1.2
Red	50.4	44.4	21.5	49 4	25 9	1 7	-0 1	0.6	1.0	0 3	1.0
Orange	53.5	41 0	30.5	51 1	36 6	2.2	0.3	0.5	0 9	0 3	1.0
Magenta	52 0	50 2	10 2	51 2	348 5	1 5	-0 4	0 6	1 0	0 3	0.6
Brown	33 7	8 6	-0 7	8 6	355 7	1.4	0 0	1 1	1 2	1.0	1 1
Neutral	94 6	0 6	-6 4	6 4	275 6	0 3	0.0	0.1	0 1	0 1	0.0
FR POLY POPLIN SINGLE STRIKE											
102 LIGHT 18 MIN SPRAY +4 HRS											
Lavender	51 3	13 0	-30.0	32 7	293 5	2 7	-1 5	0.7	0.8	0 7	0.4
Black 1	30 6	2 2	-0.1	6 4	269 5	0 6	-0 3	0 9	0 9	0 9	0 9
Blue	52 8	3 7	-26 9	27 1	277 6	3 7	-1.3	0 7	0 7	0 7	0.7
Cyan	66 9	-20.6	-33 6	39 3	239 5	5.4	-1 5	0.6	0.3	0 7	0.7
[illegible]	72 4	33.0	26.6	41.9	142.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Page 2

LU395

POLY POPLIN

Fabric Type	Colour Values L*	a*	b*	C*	h*	DK	DH	V	M	C	Y
Brown	45 3	11.4	-2.1	11.8	349 5	1 1	-0 1	0.8	0 9	0 7	0.8
Neutral	84 7	0 8	-6 6	6.8	276 5	0 5	0 1	0 1	0.1	0 1	0.0
FR POLY POPLIN DOUBLE STRIKE 102 LIGHT 18 MIN SPRAY - 4 HRS											
Lavendor	39 9	14 4	-31 6	34 7	294 4	2.3	1 7	1 0	1 0	1 0	0.8
Black 1	28 5	2 0	-3 1	3 7	302 7	0 9	-0 1	1 2	1 2	1 2	1.1
Blue	41 5	3 6	-26 1	26 3	277 8	4 7	-2 3	1 0	0 9	1 0	0.8
Cyan	60 2	-21 9	-35 8	44 4	240 4	3 8	-2 2	0 7	0 6	1 0	0.2
Green	69 8	35 7	24 6	43 3	145 5	11 0	2 5	0 5	0 3	0 6	0.6
Yellow	89.3	-8 5	87 3	87 8	97.2	11 8	2 1	0 1	0 1	0 1	0.6
Black 2	27 8	1 0	0 7	1 2	37.3	1 9	-0.4	1 3	1 3	1.3	1.3
Red	60.7	43.5	20.9	48 1	25 8	3 0	-0 1	0 6	1 0	0 5	1.0
Orange	63.7	40 4	30 0	50 3	36 6	3.0	0.3	0 5	0.9	0 5	1.0
Magenta	62 4	49.3	-10 0	50.3	348.5	2.4	-0 4	0 6	1.0	0 3	0.8
Brown	34 5	8 5	-0 8	8 6	354 5	2 1	-0.2	1 1	1 1	1.0	1.1
Neutral	84 3	1 0 7	-6.4	8 5	275 9	0 5	0 1	0 1	0.1	0 1	0.0
FR POLY POPLIN SINGLE STRIKE 102 LIGHT 18 MIN SPRAY - 6 HRS											
Lavendor	67 3	13 0	-30 0	32 7	293 5	5.4	1 6	0 7	0 7	0 7	0.4
Black 1	39 7	2 1	-6 1	6.5	288 2	0.9	-0.3	0.9	0 9	0 9	0.9
Blue	53 6	3 0	-26 5	26 0	276 4	4 8	-2 0	0 7	0 7	0.7	0.7
Cyan	70 1	-20 7	-32 7	38 7	237 6	6.1	-2 0	0 5	0 3	0 7	0.4
Green	72 8	-32 5	25 9	41.6	141 6	7 6	2 8	0.4	0.2	0 5	0.5
Yellow	90 6	-9 7	56 5	57.3	99 7	11 0	2 1	0 1	0 1	0.1	0.5
Black 2	37 4	1 3	-0 1	1 3	357 6	1 7	-0 7	1 0	1 0	1 0	1.0
Red	60 8	32 9	16.9	37 0	27 1	3.8	0.8	0 5	0 7	0.2	0.8
Orange	61.8	31 4	27 0	41.4	40.6	3.5	0.1	0.4	0.7	0.2	0.7
	60.0	43 8	-13.8	45.7	342.2						
		11 2		-11.4							
		0.7		0.9							

396

0,36

396

POLY POPLIN

Fabric Type	Color Values										
	L*	a*	b*	c*	h°	DE	DH	V	M	C	Y
Lavender		14.0	-31.6	34.5	294.0	2.9	-1.9	1.0	1.0	0.9	[illegible]
Black 1	29.0	1.7	-3.3	3.7	297.7	1.5	-0.4	1.2	1.2	1.2	[illegible]
Blue	42.3	3.2	-25.7	25.9	277.1	5.7	-2.8	1.0	0.9	1.0	[illegible]
Cyan	60.8	-22.1	-36.5	44.3	240.2	4.2	-2.4	0.7	0.5	1.0	204
Green	87.1	-35.8	24.6	43.4	116.5	11.1	2.5	0.5	0.3	0.6	0.8
Yellow	89.7	-8.0	84.4	85.0	97.6	14.5	2.9	0.1	0.1	0.1	0.6
Black 2	28.2	1.0	0.6	1.2	29.4	2.3	-0.5	1.3	1.3	1.3	1.3
Red	50.8	42.9	20.9	47.8	26.0	3.3	0.1	0.6	1.0	0.3	1.0
Orange	53.9	40.0	29.8	49.9	36.7	3.5	0.4	0.5	0.9	0.3	1.0
Magenta	52.3	49.1	-10.0	50.1	348.5	2.6	-0.4	0.6	1.0	0.3	0.8
Brown	33.6	8.5	0.6	8.6	356.7	1.3	0.0	1.1	1.1	1.0	1.1
Neutral	64.1	0.8	6.4	6.4	277.2	0.7	0.2	0.1	0.1	0.1	0.0

Page 1

397

U0397

250 DACRON

Fabric Type	Color Values L*	a*	b*	C*	h*	DE	DH	V	M	C	Y
FR POLY 250 DACRON SINGLE STRIKE											
Lavender	46.4	16.6	-35.1	38.8	295.3			0.8	0.6	0.8	0.4
Black 1	35.8	2.5	-4.6	5.4	297.2			1.1	1.1	1.0	1.0
Blue	47.5	5.0	-28.8	29.2	279.9			0.8	0.8	0.8	0.6
Cyan	68.0	-21.6	-36.3	42.8	240.7			0.6	0.4	0.6	0.1
Green	69.2	-36.8	28.8	46.0	143.4			0.4	0.3	0.6	0.6
Yellow	89.1	10.9	60.3	61.3	100.2			0.1	0.1	0.1	0.8
Black 2	32.8	1.2	1.1	1.6	41.4			1.1	1.1	1.1	1.2
Red	58.4	37.7	15.8	40.9	22.7			0.5	0.6	0.2	0.7
Orange	61.1	32.0	26.2	41.4	39.2			0.4	0.7	0.2	0.8
Magenta	59.7	45.6	-16.9	48.6	339.6			0.5	0.6	0.2	0.4
Brown	42.0	9.8	2.4	10.1	346.3			0.9	1.0	0.6	0.9
Neutral	93.4	1.0	-8.7	8.7	270.6			0.1	0.1	0.1	0.0
FR POLY 250 DACRON DOUBLE STRIKE											
Lavender	42.9	17.9	-36.0	40.2	296.4			0.9	1.0	0.6	0.5
Black 1	27.9	2.6	-2.6	3.7	315.5			1.3	1.3	1.3	1.3
Blue	41.0	6.1	-27.4	28.0	282.5			1.0	0.9	1.0	0.8
Cyan	62.1	-22.2	-40.1	45.9	241.0			0.7	0.4	1.0	0.2
Green	64.7	-41.3	35.8	54.7	139.1			0.5	0.3	0.7	0.7
Yellow	87.0	10.7	71.4	72.2	98.5			0.1	0.1	0.1	0.7
Black 2	25.6	0.8	1.8	2.0	66.8			1.3	1.3	1.3	1.4
Red	53.4	41.0	22.2	46.7	28.6			0.6	0.9	0.5	0.9
Orange	56.9	36.8	33.2	49.6	42.1			0.5	0.6	0.2	0.9
Magenta	55.8	49.6	-15.8	52.3	342.5			0.5	0.9	0.3	0.5
Room	34.2	6.1	-0.3	6.2	357.6			1.1	1.2	1.0	1.3
Neutral	93.2	1.1	-8.5	8.6	277.6			0.1	0.1	0.1	0.0
FR 250 DACRON SINGLE STRIKE											
[illegible]	61.1	1.5	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]

66h0TT' Th2E9T09
250 DACRON

Fabric Type	Color Values L*	a*	b*	C*	h*	DR	DH	V	M	C	Y
Yellow	89.4	9 9	42.9	44 0	103 1	17 6	2.8	0 1	0 1	0 1	0.4
Black 2	37 0	1 1	0 8	1 4	34 3	4 3	-0.2	1.0	1 0	1 0	1.0
Red	59 0	36 3	15.2	39 3	22 7	1 7	0.0	0.5	0 5	0 2	0.2
Orange	61 5	31 1	25 9	40.4	39 8	1 1	0.4	0.4	0 7	0.2	0.2
Magenta	60 4	43 8	-16 2	46 7	339 7	2 0	0 1	0 5	0 7	0 2	0.2
Brown	43 2	9 4	-2 1	9 6	347.6	1.3	0 2	0 9	0 9	0 8	0.9
Neutral	93 4	1 4	-8 4	8 5	279 2	0.4	0.4	0 1	0 1	0 1	0.0
FR 250 DACRON DOUBLE STRIKE											
102 LIGHT 18 MIN SPRAY - INITIAL 2 HRS											
Lavender	45 8	15 4	-34 2	37 5	294 3	4 2	-1.5	0.9	0 9	0.8	0.6
Black 1	30 0	2 4	-2 6	3.4	313 8	2 1	-0.3	1.2	1.2	1 2	1.2
Blue	44 5	4 2	-24 6	25 1	279 6	4.8	-1.3	0 9	0 8	0 9	0.8
Cyan	63 5	22 2	-37 5	43 5	239.4	3 0	-1.3	0.8	0.4	0.9	0.2
Green	70 5	-34 5	21.4	40 6	148 2	17.0	7.5	0.4	0.3	0.8	0.8
Yellow	88 0	-10 5	51 1	52 1	101 6	20.4	3.3	0 1	0 1	0 1	0.6
Black 2	28 7	0.8	1 7	1 9	65.6	4 1	0.0	1.2	1.2	1 2	1.3
Red	54 2	39 5	21 7	45 0	28.8	1.8	0 2	0.5	0 9	0.3	0.8
Orange	67 2	35.9	32.4	48 4	42 1	1.3	0.0	0.8	0.8	0 2	0.9
Magenta	58 1	48 9	-15.2	51 2	342.8	1 1	0 3	0.5	0 9	0 3	0.5
Brown	34 8	8 2	-0 3	8 2	358.2	0.6	0 1	1 1	1 1	1 0	1.1
Neutral	92 8	1 1	-7 5	7 6	278.6	1 1	0.2	0 1	0 1	0 1	0.0
FR 250 DACRON SINGLE STRIKE											
102 LIGHT 18 MIN SPRAY - 4 HRS											
Lavender	53 7	13 2	-31 9	34 5	292 5	7 1	-1.8	0 7	0 7	0 7	0.4
Black 1	36 0	2 4	-4 8	5 1	296 5	2.2	0 1	1 0	1 0	1 0	0.9
Blue	52 9	3 7	24 8	25 1	278 4	6.8	-0 7	0 7	0 7	0 8	0.4
Cyan	72 0	-18 6	-31.3	36 4	239.3	9 7	-0 9	0.4	0.3	0 6	0.1
Green	77.3	-26.8	12.8	29 7	154.4	21.9	7.3	0.3	0.2	0.4	0.6

Pmm?

00399

66;hOTT" Th/E9T09

250 DACRON

Fabric Type	Colour Values L*	a*	b*	C*	h*	DK	DH	V	H	C	Y
Brown	44 9	9 7	-1.5	9.8	351 3	3.1	0.9	0.8	0 9	0 7	0.8
Neutral	83 9	1.2	7.4	7 5	279.4	1.4	0.4	0 1	0.1	0.1	0.0
FR 250 DACRON DOUBLE STRIKE											
102 LIGHT 18 MIN SPRAY - 4 HRS											
Lavendor	46 6	14 3	-33 3	36 2	293 3	5 8	-2 1	0.5	0 9	0 8	0.5
Black 1	30 9	2 5	-2 5	3 6	315 1	2 9	-0.2	1.2	1 2	1 1	1.1
Blue	48 2	3 1	-23 1	23 3	277 6	6 6	-2.2	0 8	0 7	0 8	0 6
Cyan	65 5	21.5	-35 1	41 1	238 5	6 1	-1.9	0.6	0 4	0 9	0.2
Green	72 7	-31 0	18 8	36 2	151 6	25 1	9.8	0.4	0 3	0 5	0 6
Yellow	87 9	-9 6	47 2	48 2	101 5	24 2	3 1	0 1	0 1	0 1	0 6
Black 2	32.8	1 2	2 2	2 5	61 8	7 2	-0 2	1 1	1 1	1 1	1.2
Red	55 6	38 2	21 1	43 6	29 0	3 8	0 3	0 5	0 9	0 3	0.8
Orange	58 8	34 5	31 2	46 6	42 1	3 8	0.1	0 5	0 6	0.2	0.9
Magenta	50 1	48 9	15 2	51 2	342 8	1 1	0 3	0 5	0 6	0 2	0.9
Brown	37 1	8.4	0 1	8 4	0.8	2 9	0.4	1.0	1 1	0.8	1.0
Neutral	83 5	1.4	7 1	7 2	280 1	-1 5	0 6	0 1	0 1	0.1	0.0
FR 250 DACRON SINGLE STRIKE											
102 LIGHT 18 MIN SPRAY - 8 HRS											
Lavendor	50 0	11.9	30 0	32 3	291 8	12 7	2 3	0 6	0 6	0.6	0.3
Black 1	36 5	2 3	-4 4	5 0	298 0	2 7	0 1	1 0	1 0	1 0	0.6
Blue	48 8	3 0	-22 5	22 7	277 5	13 1	-1 1	0 6	0 5	0 6	0.4
Cyan	73 4	17 9	-29 6	34 6	238 9	11 9	-1 2	0.4	0 3	0 6	0.1
Green	78 2	-25 6	12 2	28 3	154 4	22 9	7 1	0 3	0.2	0 4	0.4
Yellow	89 0	-9 4	38 9	40 0	103 6	21 5	2 9	0 1	0 1	0 1	0.4
Black 2	39.2	1 4	1 5	2 0	47 4	8.6	0.2	0.9	1 0	0 9	1.0
Red	60 3	34 7	15.8	38 1	24 4	3 6	1.2	0 5	0 7	0 2	0.7
Orange	63.1	29.4	25 6	39 0	41 0	3.3	1 3	0.4	0.6	0.2	0.6
Magenta	62.0	42 2	-14.6	44.6	340 6	4 7	1 1	0.2	0 7	0 1	0.8
[illegible]	45.0	9 6	-51.4	9 7	281 5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	94.3	1.2	7.0	7 1	279 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]											
[illegible]											

310

50-00

400

66hOTT' ThZESTO9

250 DACRON

Fabric Type	Color Values										
	L*	a*	b*	C*	h*	DK	DH	V	M	C	Y
Lavender	49 0	13 2	-32 1	34 7	292 4	8 6	-2.6	0.8	0 8	0 7	0.4
Black 1	33 3	2 3	2 2	3 1	316.0	5.4	-0 2	1.0	1 0	-1 0	-1.0
Blue	52 4	2 5	-21.2	21 4	276 7	13 4	-2 6	0 7	0.7	0 7	0.6
Cyan	67 3	-20 8	-33.3	39 2	238 0	8 7	-2.2	0 5	0.4	0.8	0.3
Green	74 0	-29 2	15 5	33 1	152 1	25.4	9 7	0.4	0 3	0 6	0.8
Yellow	88 0	0 3	43 9	44 9	102 0	27.6	3.4	0 1	0 1	0 1	0.5
Black 2	32 6	1 2	2 4	2 7	63 3	7 0	-0 1	1 1	1 1	1 7	1.2
Red	56 0	37 3	20.8	42 7	29 2	4.8	0 5	0 5	0 8	0 3	0.8
Orange	66.0	34 1	31 2	46 2	42 4	4 1	0.3	0 5	0 8	0.2	0 9
Magenta	57 0	48 9	14 0	48 9	343.4	4 1	0 8	0 5	0 8	0 3	0 5
Brown	37 1	8 2	0 3	8 2	2 0	3 9	0 8	1 0	1 1	0 9	1 0
Neutral	93 4	1 3	-6.8	6.9	280 9	1 7	0 5	0 1	0 1	0 1	0.0

00401

Standard Test Method: PT-0004

Kimberly-C
Printing Technology Busi

STANDARD TEST METHOD FOR MEASURING COLOR OF DIGITAL PRINTS WITH THE CIE SYSTEM

1 Scope

1 1 This test method specifies the procedure for measuring the color of d prints using the CIE System.

1 2 The sample preparation equipment needed and measurement techniques are outlined in this STM

2 Significance and Use

2 1 The sign industry is totally dependent on color reproduction and management. CIE provides objective information on color matches or visually perceived appearance. These values also allow for computation of color differences

3 Terminology

3.1 Achromatic Color a neutral color (white gray, black) that has no hue

3 2 Chromatic: perceived as having a hue not white gray or black.

3.3 Chromatic Attributes those attributes associated with the spectral distribution of light: hue and saturation

3 4 CIE Commission Internationale de l'Eclairage translated as the International Commission on Illumination, the main international organization concerned with color and color measurement.

3 5 CIE Chromaticity Coordinates the ratios of each of the tristimulus values of a color to the sum of the tristimulus values These are designated x, y and z.

3.6 CIE 1976 L*a*b* Color Space: a uniform color space utilizing the Ad Nickerson cube root formulas, adopted by the CIE in 1976 for use in measurement of small color differences.

3 7 CIE Standard Observer a hypothetical observer having the tristimu color mixture data recommended in 1931 by the CIE for a 2° field of vision A supplementary observer for a larger 10° was adopted in 1976

Author	Date	Approved

3.8 L* - lightness-darkness (0 = black, 100 = white..

3.9 a* - red (+) / green (-) axis.

3.10 b* - yellow (+) / blue (-) axis.

3.11 ΔE* - The vector difference in CIE color space between two objects under specified conditions. $\Delta E^* = ((L^*_{std}-L^*_{std})^2+(a^*_{std}-a^*_{std})^2+(b^*_{std}-b^*_{std})^2)^{1/2}$

3.12 ΔH* - the 1976 a,b hue difference. $\Delta H^*=((a^*_{std}-a^*_{std})^2+(b^*_{std}-b^*_{std})^2-(\Delta L^*)^2-(\Delta C^*)^2)^{1/2}$

3.13 Tristimulus Values: the amounts of three reference or matching stimuli required to give a match with the color stimulus considered, in a trichromatic system.

3.14 Density, Optical: the ability of material to absorb light; the darker it is, the higher the density.

3.15 Hue: the attribute of color perception by means of which an object is judged to be red, blue, green, purple, etc.

3.16 Illuminant: incident luminous energy specified by its spectral distribution.

3.17 Light: electromagnetic radiation in the spectral range detectable by the human eye (approx. 350 to 780).

3.18 Lightness: perception by which the white objects are distinguished from gray objects and light from dark-colored objects.

3.19 Light Source: the element in an instrument or in the visual observing situation that furnishes light.

3.20 Saturation: the attribute of color perception that expresses the degree of departure from the gray of the same lightness.

3.21 Standard: a reference against which instrumental measurements are made.

4. Apparatus:

60153744 "110499

4.1 Hunter MiniScan XE Spectrocensitometer: A spectrocensitometer wit a 8° integrating sphere, reflectance specular included, in accordance with ASTM D1229-4-93 and SATM E308-90. The specimen port is circ and is 1.25 inch diameter with an 8° viewing angle and a beam dia of 1.00 inch. This instrument is capable of computing color data in C color space using spectral data, taken every 10 nm over the wavelen range from 400 nm to 700 nm.

5. Apparatus Setup:

5.1 This STM utilizes the Hunter MiniScan XE Spectrocensitometer.

5.2 Settings:

5.2.1	Standard Observer:	field of view was used in evaluating the color response functions of actual observers.
5.2.2	Standard Illuminant:	D50 - illuminant for daylight.
5.2.3	Color Space:	CIE 1976, L*a*b*, and ΔE* values.

6. Test Procedure:

6.1 Sampling Procedure:

6.1.1 Samples are printed in accordance to STM PT-2010 with 1" x 2" color blocks of the primary colors (C.M.Y.K), the secondary colors (R.G.B), and an unprinted block (W).

6.2 Testing Protocol:

6.2.1 Measurements are taken of each color 24 hours after they are printed. These measurements (L^*_{std}, a^*_{std}, b^*_{std}) are the standard (0 time) colors to which later measurements will be compared. All samples will be measured three times and averaged for each sample. These standards then can be used to quantify color gamut, brightness and other image quality tests time 0 that might be desired.

6.2.2 For color difference measurements, ΔE* is calculated by comparing the standard (L^*_{std}, a^*_{std}, b^*_{std}) against the sample

6016374 .11Oh99

Kimberly-Clark
Testing Technology Bu...

after testing has been
performed i.e.
ightfastness, waterfastness, etc... These samples will be
measured the same as 6.2.1.

60163744.110459

3/6 405

Standard Test Method: PT-0004

Kimberly-C

Printing Technology Bu

7. Report

7.1 Data should be reported for each primary and secondary color as sho in Table 1.

7.2 Data for color difference calculations should be reported for each prim and secondary color as shown in Table 2.

7.3 Generally, the standard deviation among separate readings of the sa sample should not exceed 0.05 ΔE^* units. Significantly greater stand deviation indicates either 1) operator error, or 2) instrument failure.

Table 1 Data Sheet for Reporting CIE Color Information

Method:	PT-0004	**Color**	**L***	**a***	**b***
Date:	5/19/98	Cyan			
Analyst:	ASB	Magenta			
Sample:	C-9149	Yellow			
		Black			
		Red			
		Green			
		Blue			
		White			

60153744.110499

Standard Test Method: PT-0004

Kimberly-C
Printing Technology Ba

Table 2. Data Sheet for Reporting CIE Color Difference

Method:	PT-0004
Date:	5:19:98
Analyst:	ASB
Sample:	C-9149

Color	L*samp	a*samp	b*samp	Delta
Cyan				
Magenta				
Yellow				
Black				
Red				
Green				
Blue				
White				

Color	L*std	a*std	b*std
Cyan			
Magenta			
Yellow			
Black			
Red			
Green			
Blue			
White			

60163744.1104499

347 407

Designation: G 26 – 96

NOTICE: This material may be protected by copyright law (Title 17 U.S. Code)

Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

This standard is issued under the fixed designation G 26; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This practice covers the basic principles and operating procedure for water or light-exposure apparatus, or both, employing a xenon-arc light source.

NOTE 1—This practice combines the practices previously covered in G 23 and G 24, Practice G 24, for Operating Xenon-Arc Type Apparatus for Light Exposure of Nonmetallic Materials, has been withdrawn since it is now covered in this revision of G 26 under Test Methods C and D.

1.2 This practice does not specify the exposure conditions best suited for the material to be tested, but is limited to the method of obtaining, measuring, and controlling the conditions and procedures of the exposure. Sample preparation, test conditions, and evaluation of results are covered in ASTM methods or specifications for specific materials.

1.3 This practice includes four test methods:

1.3.1 *Test Method 1*—Continuous exposure to light and intermittent exposure to water spray.

1.3.2 *Test Method 2*—Alternate exposure to light and darkness and intermittent exposure to water spray.

1.3.3 *Test Method 3*—Continuous exposure to light without water spray. Exposure conditions are characteristic of those specified by AATCC Test Method 16E-1976.

1.3.4 *Test Method 4*—Alternate exposure to light and darkness without water spray. Exposure conditions characteristic of these natural conditions experienced when exposing are in accordance with Practice G 24.

1.4 The values stated in SI units are to be regarded as the standard. The inch-pound equivalents of the SI units may be approximate.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standard:*

D 859 Test Methods for Silica in Water[2]

D 1293 Test Methods for pH [illegible]

D 4517 Test Method for Low-[illegible] Light Purity Water by Flameless [illegible]

E 691 Practice for Conducting an [illegible] Study to Determine the Precision of a Test [illegible]

G 24 Practice for Conducting [illegible] Exposures Under Glass[3]

2.2 *AATCC Standard:*

Method 16 Colorfastness to Light[4]

2.3 *CIE Standard:*

No. 20 Recommendations for the Integrated Irradiance and the Spectral Distribution of Simulated Solar Radiation for Testing Purposes[5]

2.4 *ISO Standard:*

Gray Scale[6]

3. Significance and Use

3.1 Several types of apparatus with different exposure conditions are available for use. No single operating procedure for light-exposure apparatus with or without water can be specified as a direct simulation of [illegible]. This practice does not imply expressly or otherwise that [illegible] accelerated weathering test.

3.2 Since the natural environment [illegible] subject to time, geography, and topography, it may be assumed that the effects of natural exposure will vary [illegible] materials are not affected equally by the [illegible] environment. Results obtained by use of this [illegible] be represented as equivalent to those [illegible] exposing test until the degree of quantitative [illegible] been established for the material in question.

3.3 Variations in results may be [illegible] instruments of different types or with [illegible] similar type instruments may [illegible] this practice. Therefore, [illegible] results from use of this practice, [illegible] report form shown in Fig. 1 or [illegible] a referenced procedure.

---

[1] This practice is under the jurisdiction of ASTM Committee G-3 on Durability of Nonmetallic Materials and is the direct responsibility of Subcommittee G03.04 on Standard and Controlled Environment Tests.

[illegible] Published April 1996. Originally published as E 239 – 64 T. Redesignated G 26 in 1970. Last previous edition G 26 – 94.

[2] *Annual Book of ASTM Standards*, Vol 11.02.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 07.01.

[5] Available from The Secretary, American [illegible] Galvanic, P.O. Box 12215, Research Triangle [illegible]

[6] Available from Secretary, U.S. [illegible] of Standards and Technology, Gaithersburg, [illegible]

G0126 96

0b1537a 1104b59

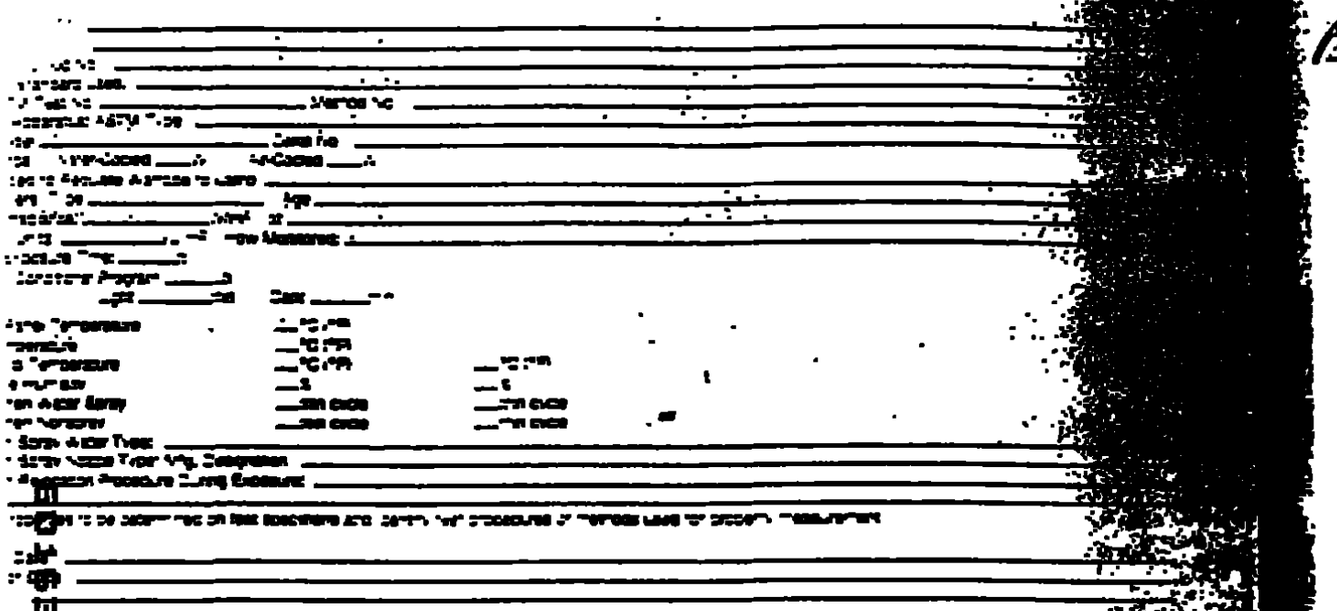


FIG. 1 Report Form

...apparatus

...Water-Cooled Type

...The apparatus employed should utilize a water-cooled xenon-arc lamp as the source of radiation and should be of the following general types, or their equivalent:

...4.1.1 *Type A*—An exposure apparatus in which the ultraviolet energy shall be a water-cooled xenon-arc lamp mounted at the central axis of either a 508-mm (20-in.) diameter vertical specimen rack, or of a 648-mm (25.5-in.) diameter inclined rack. Means shall be provided for automatic programming of temperature and cycles. Means shall be provided for adjustment of relative humidity. The specimen rack shall rotate at 1 ± 0.1 rpm.

...4.1.2 The commercial designations of the four types, the term ... indicated as ultraviolet (UV) light, darkness, and water ... is provided differently in accordance with the different testing ...

...4.1.2 *Type AH*—The exposure apparatus shall be identical to Type A except it shall have automatic humidity ...

...4.1.3 *Type B*—An exposure apparatus in which the ... of radiant energy shall be a water-cooled xenon-arc lamp ...ally located at the central axis of a 960-mm (37.75-in.) diameter specimen rack. Means shall be provided for automatic programming of temperature and cycles. Means may be provided for adjustment of humidity. The specimen rack shall rotate at 1 ± 0.1 rpm.

...4.1.4 *Type BH*—The exposure apparatus shall be identical to Type B except it shall have automatic humidity ...

4.1.2 The xenon-arcs employed shall be of the ... water-cooled type operated through suitable reactance ... transformers and electronic equipment from a 50 or 60-Hz ... supply. They shall employ cylindrical inner and outer ... filters to direct the flow of cooling water and to ... designed spectral energy distribution.

4.1.2.1 For the purpose of this practice, the xenon-arc lamp shall consist of a quartz xenon burner tube ... the following optical filter combinations as recommended by the manufacturer:

(a) Borosilicate glass inner and outer optical ... simulate the spectral power distribution (SPD) of ... daylight throughout the acinic region.

(b) Infrared absorbing glass inner optical filter ... outer optical filter to simulate the SPD of natural ... 300 to 1000 nm.

(c) Borosilicate glass inner optical filter with ... glass outer optical filter to simulate the SPD ... daylight (actinic wavelengths) filtered through window ...

(d) Infrared absorbing glass inner and outer ... to simulate the SPD of natural daylight (310 ... filtered through window glass.

(e) Quartz inner and outer optical filter to ... sunlight intensities unfiltered by the earth's atmosphere.

4.1.2.2 To prevent loss in levels of light ... excessive polarization, and to prevent ... caused by solarized optical filters exposed to ... UV energy, inner optical filters shall be replaced ... Suggested intervals are 300 and 400 h for Types ... respectively. The outer optical filter shall be ... 1500 and 3000 h for Types A and B, respectively.

4.1.3 Distilled or deionized water should be ... ...ter. The Designer of a flow rate sufficient to ...

...ness contamination of the quartz envelope of the ...ner. A heat-exchange unit should be used to cool the ...culated tap water.

...3 Since xenon-arc lamps, like all gas discharge lamps, ...e a progressive drop in radiation output with ...reased use, and since optical filters will change in their ...ransmission characteristics, provision shall be made in the ...ipment to automatically or manually (or progressively in- ...rease the wattage of the lamp to minimize changes in the ...ensity of the radiation at the face of the samples. The ...greatest change in both the xenon burner tube and optical ...ilters occurs in the first 20 h of use. For this reason, burners ...and optical filters preaged by the instrument manufacturer ...are recommended for critical testing when a more rapidly ...changing rate of intensity is undesirable. For routine testing ...on a comparative basis, the 20 h of preaging may be omitted.[4]

...1.5 Many nonmetallic materials are selectively ab- ...sorbing. The energy that a molecule absorbs depends upon ...the wavelength of the incident radiation.[5] It is desirable to ...monitor the level of irradiance of the photochemically ...effective wavelengths if interlaboratory tests are to be made ...using samples not exposed simultaneously. Samples may ...then be exposed to known amounts of irradiation, the time ...integral of irradiance.

...1.5.1 Where radiometers capable of monitoring discrete ...portions of a continuous spectrum are available, exposure to ...a mutually agreed-upon level of irradiation may be specified ...as the exposure interval in place of a time interval.

...a) When using the optical filter combination described in ...1.2.1 (a), the suggested minimum spectral irradiance levels ...are

.2 W/m²/nm band at 320 nm
.35 W/m²/nm band at 340 nm
.5 W/m²/nm band at 380 nm
.75 W/m²/nm band at 420 nm

...b) When using the optical filter combination described in ...1.2.1 (b), the suggested minimum spectral irradiance levels ...are

.2 W/m²/nm band at 340 nm
.35 W/m²/nm band at 380 nm
.7 W/m²/nm band at 420 nm

...c) Operating at the suggested minimum levels approxi- ...mates the average daily solar irradiance under ideal condi- ...tions. It is about half of the maximum values for total ...irradiance on a horizontal plane when the sun is at 90° ...altitude as reported in CIE No. 20. When irradiance is ...monitored and periodic manual adjustment of voltage is ...made to compensate for changes of intensity, no lamp ...assembly should be used that cannot maintain the minimum ...level of irradiance within ±10 % tolerance at the monitored ...wavelength. Irradiation, measured as joules per square metre, ...is the product of irradiance × exposure time in seconds.

...1.5.2 Xenon-arc type equipment not having a radiom- ...eter shall be operated with periodic increases in wattage to ...minimize any drift in levels of irradiation. Such intervals ...shall be established by the parties concerned or follow the ...suggested schedule below in 4.1.5.2 (a).

...Note 2—The use of suggested wattage ...irradiance will be maximized at levels ...when employing a new mixture. This ...minimize the reduction of UV intensity with ...when using either Test Method A or C for ...specimens.

...a) The following are the suggest... ...each exposure interval of a 2500-W ... ...upon the average performance of ... ...borosilicate filters:

Time, h
0 to 20
20 to 200
200 to 400
400 to 600
600 to 800
800 to 1000
1000 to 1200
1200 to 1500

...b) The following are the suggest... ...for each exposure interval of a 6000-W ... ...upon the performance of xenon ... ...borosilicate filters in Test Method A:

Time, h
0 to 20
20 to 140
100 to 250
250 to 400
400 to 550
550 to 700
700 to 850
850 to 1000

...c) The following are the suggested ... for each exposure interval of a 6500-W xenon-burner ... based upon the average performance of xenon-burner ... with borosilicate filters in Test Method A:

Time, h
0 to 20
20 to 100
100 to 200
200 to 300
300 to 1000
1000 to 1500
1500 to 2000
2000 and over

4.1.6 Specimens should be mounted ... about the lamp at a distance such that ... specimen ensures that the irradiance ... does not vary by more than 5 % ... illuminate a single plane.

4.1.7 Any apparatus that ... condition of 4.1.6 shall not have ... exceeding 10 % of the average ... rotating/translating during exposure ... procedure in order to minimize ... exposure.

4.1.8 Testing temperatures should ... ...ated on the basis of a black ... mounted on the specimen racks ... but the sensor position and ... influences the test specimen ... ...ter unit should control ...

3EC 409
0170
60163744 - 110499

...s thermometer should have a stem approx... ...in.) in diameter with a 44.5-mm ... in.). The sensitive portion extending about 31 mm ... from the end of the stem should be located in the ... the panel approximately 64 mm (2.5 in.) from the ... approximately 38 mm (1.5 in.) from the bottom ... rame. The area of the panel with the thermometer ...mounted should be flushed with a baked-on black ...-resisting coating having good resistance to heat.

... A thermocouple or resistance bulb thermometer ...ed in the center face of the black panel, which ...s temperature values equivalent to the dry thermom... ...may be substituted.

... A blower unit in the base of the apparatus should ...e a flow of air through the test chamber and over the ...mens. Control of specimen and black-panel temper... ...atures is accomplished by thermostatic control of the ...erature of the constant volume of air from the blower. ...ange temperatures should be read through the ... of the test chamber door without opening the door.

... Apparatus operated as a light- and water-exposure ...tus is equipped with a specimen spray unit as illus... ...Figs. 3 and 4. All components of the specimen spray ...should be fabricated from stainless steel, plastic, or other ...terial that does not contaminate the water. Apparatus oper... ...ed as a light-exposure test are not required to have the ...men spray unit or, if present, it should not be used.

... Types A, AH, BH, and some Type B apparatus are ...ped with an electrically operated vaporizing unit for ...g moisture to the air as it passes through the condi... ...chamber in the base section prior to its entry into the ...ber of the apparatus.

... In Types A and B, the vaporizing unit, when ...ally turned on, may operate continuously while the ...ratus is in operation. Type A and some Type B ...ratus may be programmed to operate the vaporizer ...g a dark cycle only. The temperature of the water, with ...h the vaporizer is supplied, is not controlled. In Type B ...ratus not supplied with a vaporizing unit, the relative ...idity within the test chamber is governed by evaporation ...ater in the bottom of the chamber and from water ...ed through the specimen spray unit.

... In Types AH and BH apparatus, operation of the ...rizer is controlled automatically by a wet-bulb thermo... The temperature of the water supplied to the vaporizer ...ulated automatically by thermostatically-actuated elec... ...immersion heaters. Control automatically shifts between ...separate sets of thermostats as the arc lamp is turned on ...off by the program control unit.

... In Types A, B, AH, and BH apparatus containing ...rizing unit, relative humidity is determined from wet- ...dry-bulb thermometers located in the air stream at the ...rizer's point of exit from the test chamber.

... Determine the relative humidity for Type B ...ratus not equipped with a vaporizing unit from wet- and ...-bulb thermometers mounted in holders on the specimen ...k so that their sensitive portions are in the same relative ...tion as the face of the test specimens but shielded from ...radiance.

... Other apparatus types, differing only as ...ated ... the ... with ...

...essentially the same conditions of relative ... ...produced in Type B apparatus without a vapor...

... The apparatus shall include means for ... the following:

... Wattage of the xenon arc lamps,

... Irradiance at the specimen rack,

... Black-panel temperature,

... Dry-bulb temperature (test chamber),

... Wet-bulb temperature (test chamber),

... Exposure interval, and

... Water spray pressure when applicable.

... Where specified, the apparatus shall be ... for regulating or controlling the following:

... Wattage of the xenon lamps,

... Irradiance or irradiance, or both, ... men rack,

... Temperature (test chamber),

... Relative humidity (test chamber),

... Light-cure-spray-humidity-temperature ...ing, and

... Water spray pressure when applicable.

... *Air-Cooled Types*

... The apparatus employed shall use an ... xenon-arc lamp as the source of radiation and shall ... of the following types, or their equivalent:

... *Type C*—Air-cooled xenon-arc appara... W, 158-mm (6.2-in.) diameter specimen rack, ... matic programming of cycles and humidity. The ... rack should rotate at 5.2 ± 0.1 rpm.

... *Type D*—Air-cooled xenon-arc appara... W, 360-mm (14.2-in.) diameter specimen rack, ... matic programming of temperature, cycles, and ... The specimen rack should rotate at 3.7 ± 0.1 rpm.

... *Type E*—Air-cooled xenon-arc appara... lamps operating simultaneously at 4500 W each ... (24.1-in.) diameter specimen rack, with automa... ming of temperature, cycles, and humidity. The ... rack should rotate at 2.0 ± 0.1 rpm.

... The xenon arcs employed in Types C and ... be of the medium-pressure, air-cooled type and ... optical filters shall be fitted between the light sou... samples to filter out unwanted wavelengths of ... combination of optical filters recommended by ... turer shall be used to simulate (*1*) sunlight in ... sunlight behind window glass, or (*3*) any oth... solar irradiation condition desired.

... All gas discharge lamps have a progr... radiant output with continued use. For Type ... recommended to discharge the IR-optical fil... after 3500 h of use. Answering the purpose ... IR-optical filters of the filter lantern should ... the same time but each should be exchanged ... running for 3500 h. For Type E which has dif... lamp should be replaced every 500 h to minimi... drop in radiant output. For Type E, the three p... filters should be cleaned monthly and repla... years of normal usage.

321 410

C0417

3275 411

0042

G 26

6616374 .4104499



FIG. 2 Three-Tiered Specimen Rack

4.2.4 Specimen holders should rotate around the arc, describing a cylindrical surface, so that specimens may face, or be turned opposite to, the arc. No part of the specimens shall be above or below the ends of the arc. Repositioning of specimens in upper, center, or lower positions can improve the uniformity of intensity of the exposure.

4.2.5 Testing temperatures should be measured and regulated on the basis of a black-panel thermometer unit that is mounted so that the face of the unit is in the same relative position and is subjected to the same influences as the test specimens. The black-panel thermometer unit should consist of a stainless steel panel approximately 48 by 200 by 1 mm, (1.9 by 8.0 by 0.04 in.), to which a stainless steel bimetallic-dial-type thermometer is mechanically fastened. The temperature at the center of the panel should be sensed by the thermometer. The face of the panel should be finished with a baked-on black glass enamel having good stability to light.

4.2.6 A blower unit, in the base of the apparatus shall provide a flow of air through the test chamber and over the test specimens. Uniformity of the specimen and the black-panel temperature should be accomplished by thermostatic control

blower. Black-panel temperature should [illegible] through the window in the test chamber door with[illegible] outdoor.

4.2.7 The apparatus should be equ[illegible] to spray the specimens uniformly wit[illegible] should be of stainless steel, plastic, [illegible] that does not react with or contaminate [illegible]

4.2.8 Relative humidity in the te[illegible] be measured and controlled by a cont[illegible] should be vaporized, and diffused [illegible] moisture and produce the required [illegible]

4.2.9 The apparatus shall include [illegible] measuring and controlling the zone [illegible] water-cooled Zenin type[illegible]

5. General Procedure

5.1 Check to be sure the apparatus [illegible] the start of each test. Check the [illegible] intervals to be sure the burner tube [illegible] clean, and that they have not [illegible] recommended period of use.

5.2 Program the instrument to [illegible]

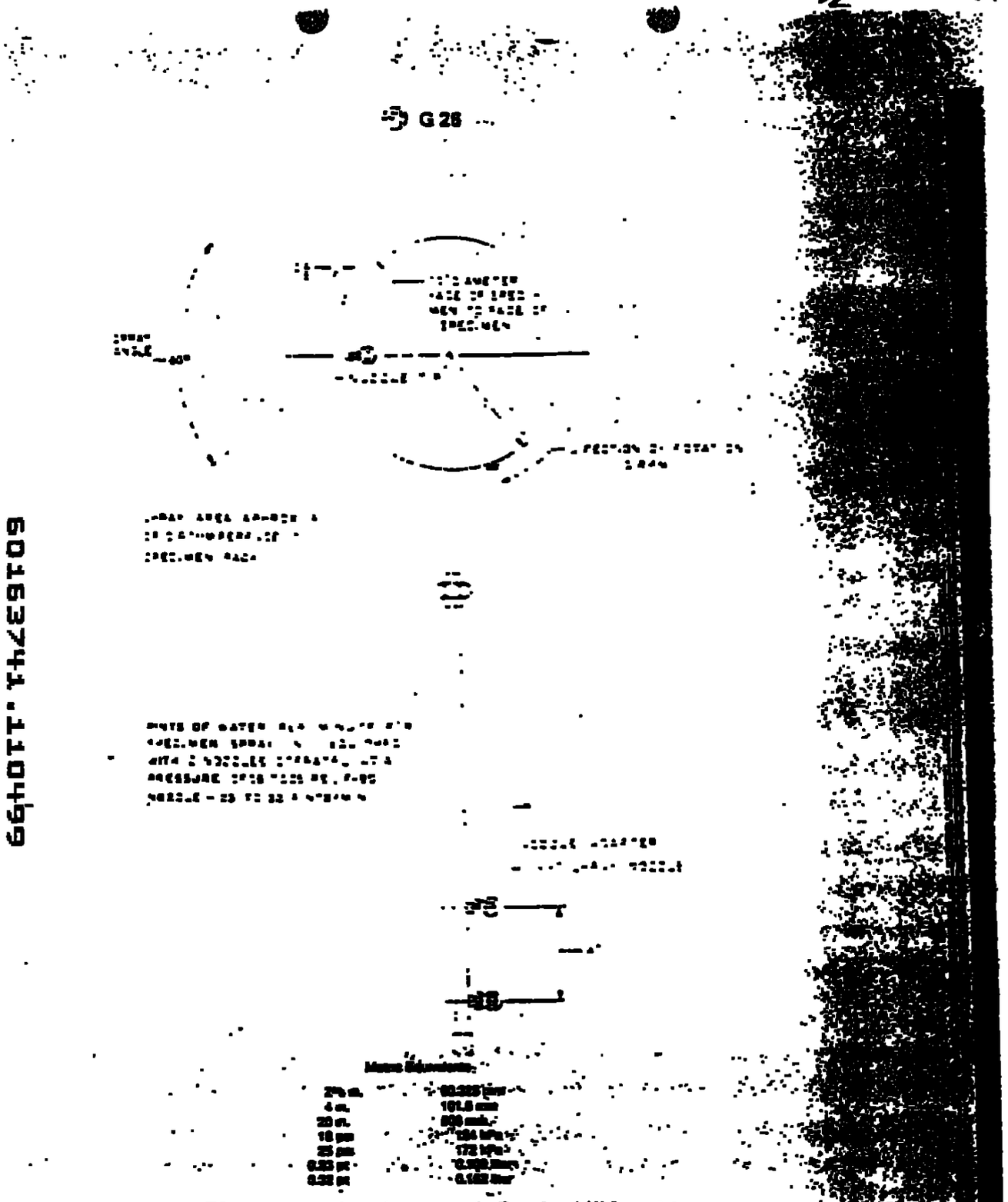


FIG. 3 Specimen Spray Arrangement for Type A and AH Apparatus

...s blanks and the blackened thermometer. Operate the ... 5.3 When the chamber dry-bulb tempera... trument is in this mode, while rotating the chamber ... dry-bulb temperature to provide the desired black-panel ... to the desired relative humidity (Type C ...

3,709,413
7,300
G 28
60163741 -110499

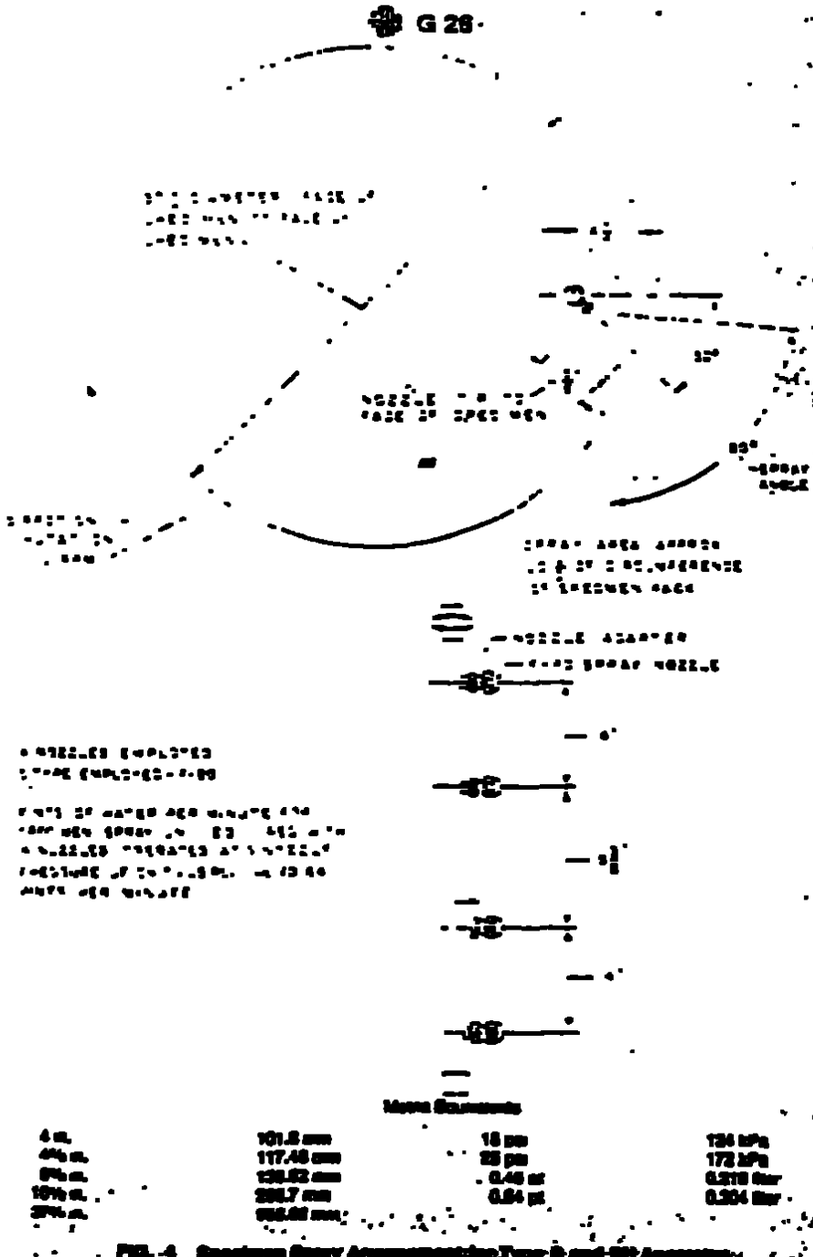


FIG. 4 Specimen Spray Arrangement for Type B and D Apparatus

level that will ensure the desired relative humidity.

5.3 In Types A, B, C, D, and E apparatus, use the type and number of spray nozzles (Figs. 2 and 3) recommended by the manufacturer and operate at a pressure of 124 to 172 kPa (18–25 psi) measured at the nozzle unless otherwise specified. Pass the specimens through the spray 1 to 2 times in each minute or revolution of the rack during the spray cycle. Allow the water to strike the test specimens in the form of a fine spray equally distributed over the specimens.

5.4.1 *Water used*

Typically, the temperature of the wat
spray is near the ambient temperatur
which the devices are operated (23
specimen spray is chilled, specimens c
rapid temperature changes that may not
exposures.

5.4.2 *Water Purity*

5.4.2.1 The purity of water used

...Water used for specimen spray shall have no ...more deposits or stains on the exposed specimens. It ...is recommended that the water contain a maximum ...of 200 ppm solids and a minimum of 0.2 ppm silica. Silica ...shall be determined using the procedures defined in ...Method D 859 or Test Method D 4517. Prepackaged ...salts are commercially available that are intended ...to produce levels of less than 200 parts per million solids. ...Combination of deionization and reverse osmosis treatment ...is effective to produce water with the desired purity. If ...the water used is above 1 ppm solids, the solids and ...silica must be reported. Recirculation of water used for ...the spray is not recommended and must not be done ...unless the recirculated water meets the above requirements.

...If specimens are found to have deposits or stains ...present in the apparatus, the water purity must be ...tested to determine if it meets the requirements above. On ...occasions, exposed specimens can be contaminated by ...certain bacteria that can grow in the purified water ...of the specimen spray. If bacterial contamination is ...found, the entire system used for specimen water spray ...should be flushed with a chlorinating solution such as sodium ...hypochlorite and thoroughly rinsed prior to resuming exposures. Although it doesn't always correlate with stain and deposits, it is recommended that resistivity of water used for ...the spray be continuously monitored and that exposures be discontinued whenever the resistivity falls below one ...megohm.

...When the water purity requirements above are ...used and there is disagreement between parties on the extent of effects caused by stain or deposit, the referee tests in an ...outside laboratory which can meet the water quality requirements described in sections 5.4.2.1 and 5.4.2.2.

...The temperature of the rack spray water should be ...controlled to reduce the specimen temperature below ...100°F when the specimen is continuously sprayed ...during the dark cycle.

...ference Standards

...1.1 Blue Wool Lightfastness Standards,[3]

...The eight standards L-2 to L-9 have been made by ...dyeing wool with the Lanaset dye Erio Chrome Azurine B and ...with the fast dye Indigosol Blue AGG in different strengths. ...Bleached wools were spun into yarns and the yarns woven into ...cloth. The standard is approximately twice as fast as the next lower ...numbered standard. It has been found that when new lots of the ...dyes are produced, the amounts of the dyes required and the ...ratio of the two dyes in the blends are often different from batch ...to batch. The dyeing strength and blending proportions would ...be interesting, and they are kept confidential and secluded.

...Any standard sample established by mutual agreement between the purchaser and the supplier.

...ISO Gray Scale for Assessing Change in Color.[4]

...When the material to be evaluated is suspected of ...being sensitive to variations in ultraviolet exposure and the ...test does not meet the requirement of 4.1.6, it is the ...responsibility of the concerned parties to mutually agree ...upon a reinstatement schedule for specimens as part ...of the exposure program in order to minimize any effects ...of variations in ultraviolet output that may have as a function of ...deposition.

TEST METHOD A—CONTINUOUS EXPOSURE TO LIGHT AND INTERMITTENT EXPOSURE TO WATER SPRAY

6. Procedure

6.1 Apparatus shall be Type A, B, AH, BH, C, ...light-exposure device.

6.2 Program the instrument for continuous light and intermittent water spray in accordance with the manufacturer's instructions. Choice of the program selected by ...mutual agreement among the interested parties. In ...convention has established a cycle of 102 min ...followed by a cycle of 18 min of light and water spray ...commonly accepted program that permits the attainment of ...the maximum black-panel temperature during the light ...portion of the cycle.

6.3 In Types AH and BH apparatus, adjust dry-bulb and ...wet-bulb temperature controls, humidifier, and inlet ...heater controls to maintain the desired conditions as ...specified in Section 5. In Types C, D, and E, adjust the chamber ...temperature and humidity controls to maintain desired ...conditions as specified in Section 5.

6.4 In Types A and B with humidifier, humidity is ...adjusted but not controlled.

6.4.1 Type B instruments without a humidifier ...operate with whatever humidity occurs from the evaporation ...of water in the bottom of the test chamber and ...specimen spray.

TEST METHOD B—ALTERNATE EXPOSURE TO LIGHT AND DARKNESS AND INTERMITTENT EXPOSURE TO WATER SPRAY

7. Procedure

7.1 Apparatus shall be Type A, B, AH, BH, or E ...exposure device.

7.1.1 Types AH, BH, and E apparatus with ...humidity controls may be operated on alternate light and ...dark cycles.

7.1.1.1 Operation during the light-on cycle shall be ...described in Section 6.

7.1.1.2 Separate controls for temperature and ...humidification may be adjusted during the dark cycle ...automatic control as the program alternates from light to ...dark. In Type BH and E apparatus, a rack spray of ...specimens by wetting the unexposed back surface ...in development of condensation on the exposed ...surface during the dark cycle.

7.1.2 Types A, B, AH, BH, and E may be programmed ...operation on alternate light and dark cycles without control ...relative humidity.

TEST METHOD C—CONTINUOUS EXPOSURE TO LIGHT WITHOUT WATER SPRAY

8. Procedure

8.1 Apparatus shall be Types A, B, AH, BH, C, ...light exposure devices programmed for continuous ...

...Copyright ASTM, International, No. (all rights reserved); ...Document provided by: ASTM ...Not for resale, reproduction or distribution ...No part may be reproduced or networked in any form in any medium without permission of ASTM ...Users subscribe to terms and conditions available at: ...P.O. ...

...Xenon Arc C or D described in 4.1.2... and ...a be used.

...1 Adjust the controls on the apparatus so that the ...-panel temperature is 63 ± 3°C ...5 ± 5°F) and the ...relative humidity is 50 ± 5 % when the xenon lamp is ...ated at a wattage that provides 0.35 AATCC Fading Units ...exposure in about 15 to 25 clock hours. Check at regular ...rvals and, when necessary, readjust the controls to ...aintain the specified values for these variables. Target ...lues for black panel temperature, 0.35 AATCC Fading ...nits, and relative humidity should be 63°C, 22 clock hours, ...d 50 %, respectively.

...TE 5—0.35 AATCC Fading Units is equivalent to a 4.5 ± 0.2 ...-CIELAB-E94) unit change in Blue Wool Lightfastness ...andard L2 based on the ISO Gray Scale ...measured at about 110 kJ/m² (1.5 W·m⁻²·h⁻¹) exposure at 420 nm ...as been found sufficient to produce the specified ...ommon.

...1.2 Expose the material to be tested as determined by ...mutual agreement among the concerned parties or, when not ...otherwise specified, in accordance with one of the following:

...1.2.1 *Versus One AATCC Blue Wool Lightfastness ...ndard*—Expose the test specimen and any mutually ...greed-upon AATCC Blue Wool Lightfastness Standard ...ntil the selected standard between its exposed and unex-posed portion exhibits a color change equal to Step 4 of the ISO Gray Scale. Report the results by any mutually agreed-upon method of measuring change in the test specimen.

...1.2.2 *Versus Set of AATCC Blue Wool Lightfastness ...ndards*—Expose the test specimen and a set of AATCC Blue Wool Lightfastness Standards until a maximum permissible amount of change, as determined by any specified or mutually agreed-upon method of measurement, occurs in the test specimen. Assign it a classification number equal to that of the numbered standard that most nearly exhibits a change in color equal to Step 4 on the ISO Gray Scale between its exposed and unexposed portion. Where one standard shows a color change greater than Step 4 and the next higher number standard shows less than a Step 4 color change, an intermediate or half-grade rating may be used.

...1.2.3 *Versus Other Standard Samples*—Expose the test specimen and any mutually agreed-upon standard sample until either, by any specified or mutually agreed-upon method of measurement, shows an agreed-upon amount of change. Report the results on the basis of a comparison of the specimen with the standard sample.

TEST METHOD D—ALTERNATE EXPOSURE TO LIGHT AND DARKNESS WITHOUT WATER SPRAY

9. Procedure

9.1 Apparatus shall be Types A, B, AH, BH, or E programmed to predetermined cycles of light and darkness, by turning off the xenon lamp.

NOTE 6—Type B apparatus not equipped with a vaporizing unit do not meet the requirements of Test Method D. In Type A and Type B apparatus with intermittent blower operations during the light-off cycle and the atmosphere in continuous operation, the test chamber air temperature will drop as fresh room air has the heat removed by evaporation of water from wicks and atomizer.

9.1.1 Unless otherwise specified, exposure conditions shall be identical to Method B except that during the light-only cycle the conditions shall be 40 ± 5 % relative humidity and temperature of 35 ± 3°C (95 ± 5°F).

10. Report

10.1 Report the following information:

10.1.1 Type and model of exposure ...

10.1.2 Type of light source and ...

10.1.3 Type and age of filters ...

10.1.4 Spectral irradiance at ... (see Note 7).

10.1.5 Irradiance, kJ/m².

10.1.6 Elapsed exposure time, h.

10.1.7 Light- or dark-exposure-interval ...

10.1.8 Operating black-panel temperature.

10.1.9 Operating relative humidity.

10.1.10 Type of spray water.

10.1.10.1 Total solids and silica ... specimen spray (if above the limits ...

10.1.11 Type of spray nozzle and ...

10.1.12 Specimen relocation procedure.

NOTE 7—When direct measurement of ... spectral irradiance cannot be made, data supplied by the ... shall be adequate. Irradiation in kilowatts per square meter ... by multiplying the product of the irradiance in watts per square meter and the exposure time in hours by the factor 3.6 ...

11. Precision and Bias

11.1 *Precision:*

11.1.1 The repeatability and reproducibility ... obtained in exposures conducted according to this practice will vary with the materials being ... material property being measured, and the specific ... and cycles that are used. In round-robin studies conducted by ASTM subcommittee G3.03, the 60° specular gloss of replicate PVC tape specimens exposed in different ... using identical test devices and exposure cycles ... variability. The variability shown in ... robin studies restricts the use of "absolute" ... requiring a specific property level after ... exposure period.

11.1.1.1 If a standard or specification ... requires a definite property level after ... or radiant exposure in an exposure ... to this practice, the specified property ... results obtained in a round-robin ... mention the variability due to the ... method used to measure the ... round-robin test shall be ... E691 and shall include ... of all laboratories or organizations ... conduct this exposure and property ...

11.1.1.2 If a standard or specification ... or three parties requires ... specific time or radiant exposure ... ducted according to this practice, ... shall be based on statistical analysis ...

---

[1] Pfaender, R. M., "Limits of Round ... Exposure Tests," ...

327 416
C0417

...ratory independent exposures in each laboratory. The ... the experiment used to determine the specification ...ake into consideration the variability due to the ...ial and the test method used to measure the property ...test.

...1 The round-robin studies demonstrated that ...ia values for a series of materials could be ranked with ...evel of reproducibility between laboratories. When ...ability in results from an exposure test conducted ...ng to this practice have not been established through ...ntrol testing, performance requirements for materials ...e specified in terms of comparison (ranked) to a ... control specimen. The control specimen shall ... simultaneously with the test specimen(s) in the ... The specific control material used shall be agreed ... the concerned parties. Expose replicates of the ... and the control specimen so that statistically ... performance differences can be determined.

...11.2 *Bias*—...

...11.2.1 Bias cannot be determined because ... standard weathering reference materials are ...

12. Keywords

12.1 degradation; ultraviolet weathering; ...

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

D01637H4 .110H99

Colorfastness to Water Spotting

Developed in 1982 by AATCC Committee RA23; reaffirmed 1986, 1989, 1972, 1975, 1978, 1986, 1989; editorially revised and reaffirmed 1991, 1993, 1994. Technically equivalent to ISO 105-E07.

1. Purpose and Scope

1.1 This test method is designed to evaluate the resistance to water spotting of dyed, printed, or otherwise colored textile fabrics.

1.2 The test method does not determine whether the discoloration is removable.

2. Principle

2.1 The test specimen is spotted with distilled or deionized water and evaluation is made of change of color, after wetting and after drying.

3. Terminology

3.1 colorfastness, n.—the resistance of a material to change in any of its color characteristics, to transfer of its colorant(s) to adjacent materials, or both, as a result of the exposure of the material to any environment that might be encountered during the processing, testing, storage or use of the material.

4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

5. Apparatus and Materials

5.1 Glass rod.

5.2 AATCC Gray Scale for Color Change (see 11.1).

5.3 Pipette, graduated, 1 mL.

5.4 Distilled or deionized water.

6. Test Specimens

6.1 Colored cloth specimens, approximately 15.2 × 15.2 cm (6 × 6 in.).

7. Procedure

7.1 With tip of pipette in contact with cloth, run onto the specimen 0.15 mL water at room temperature. If necessary, work water in with a rounded glass rod to assist penetration.

7.2 Evaluate the change in color in the periphery of the spot after 2 min wetting and after drying at room temperature by use of the Gray Scale for Color Change.

8. Evaluation

8.1 Rate the effect on the color of the test specimens by the Gray Scale for Color Change (see 11.1).

Grade 5—negligible or no change as shown in Gray Scale Step 5.

Grade 4-5—change in color equivalent to Gray Scale Step 4-5.

Grade 4—change in color equivalent to Gray Scale Step 4.

Grade 3-4—change in color equivalent to Gray Scale Step 3-4.

Grade 3—change in color equivalent to Gray Scale Step 3.

Grade 2-3—change in color equivalent to Gray Scale Step 2-3.

Grade 2—change in color equivalent to Gray Scale Step 2.

Grade 1-2—change in color equivalent to Gray Scale Step 1-2.

Grade 1—change in color equivalent to Gray Scale Step 1.

9. Report

9.1 Report type of water and pH of water used for the test.

9.2 Report the grade for change in color after 2 min and after drying at room temperature.

10. Precision and Bias

10.1 *Precision.* Precision for this method has not been established. There is no contemplated activity to establish precision for this method. Users of this method should use standard statistical techniques in making any comparisons of test results for either *within-laboratory* or *between-laboratory* averages.

10.2 *Bias.* Colorfastness to water spotting can be defined only in terms of a test method. There is no independent method for determining the true value. As a means of estimating this property, this method has no known bias.

11. Note

11.1 *Available* from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: 919/549-8141; fax: 919/549-8933; e-mail: orders@aatcc.org.

			CIE					
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE A Burgundy Standard		D65	10	28.4	28.7	2.8		
TYPE A Magenta Standard		D65	10	34.4	49.3	9.4		
TYPE A Orange Standard		D65	10	45.3	42.9	26.8		
TYPE A Red Standard		D65	10	36.1	47.9	15.5		
TYPE A Yellow Standard		D65	10	82.5	6.3	84.2		
TYPE A Green Standard		D65	10	61.2	-21.5	54.9		
TYPE A Cyan Standard		D65	10	48.4	-26.1	-26.1		
TYPE A Blue Standard		D65	10	29.2	6.6	-18.7		
TYPE A Black Standard		D65	10	21.5	6.3	-13.1		
TYPE A Lavendar Standard		D65	10	26.1	19.2	-12.1		
TYPE A Burgundy	Water Washed	D65	10	29.4	30.3	-0.1	3.3	2.8
TYPE A Magenta	Water Washed	D65	10	37.1	54.2	10.7	5.7	0.3
TYPE A Orange	Water Washed	D65	10	46.6	48.0	24.8	5.8	-4.2
TYPE A Red	Water Washed	D65	10	38.9	53.5	15.9	6.3	-1.3
TYPE A Yellow	Water Washed	D65	10	86.3	-6.3	81.4	13.5	12.6
TYPE A Green	Water Washed	D65	10	66.6	-38.9	54.0	18.3	15.7
TYPE A Cyan	Water Washed	D65	10	50.9	-31.7	-29.6	7.1	-1.4
TYPE A Blue	Water Washed	D65	10	28.1	7.1	-23.4	4.9	-1.0
TYPE A Black	Water Washed	D65	10	22.8	5.4	-16.8	3.8	-2.1
TYPE A Lavendar	Water Washed	D65	10	26.3	18.9	-15.9	3.8	-3.2
TYPE A Burgundy	Detergent Washed	D65	10	37.2	30.7	-8.2	14.1	10.8
TYPE A Magenta	Detergent Washed	D65	10	44.3	52.7	-0.5	14.4	10.2
TYPE A Orange	Detergent Washed	D65	10	53.8	39.7	13.8	15.9	-10.2
TYPE A Red	Detergent Washed	D65	10	45.9	49.8	5.0	14.4	-10.7
TYPE A Yellow	Detergent Washed	D65	10	83.2	-8.2	53.3	34.2	15.3
TYPE A Green	Detergent Washed	D65	10	67.0	-35.8	37.1	23.5	21.6
TYPE A Cyan	Detergent Washed	D65	10	52.8	-29.5	-29.7	6.5	0.2
TYPE A Blue	Detergent Washed	D65	10	32.6	5.7	-26.2	8.3	-2.8
TYPE A Black	Detergent Washed	D65	10	26.0	4.5	-18.8	7.0	-3.6
TYPE A Lavendar	Detergent Washed	D65	10	31.7	18.5	-21.7	11.1	-7.6
TYPE A Burgundy	Steamed	D65	10	25.7	23.7	3.3	5.7	1.3
TYPE A Magenta	Steamed	D65	10	33.5	49.9	12.0	2.7	2.3
TYPE A Orange	Steamed	D65	10	40.4	48.7	31.5	8.9	0.9
TYPE A Red	Steamed	D65	10	34.3	49.3	19.3	4.5	3.1
TYPE A Yellow	Steamed	D65	10	85.5	-1.6	99.8	17.7	8.4
TYPE A Green	Steamed	D65	10	60.9	-36.6	61.2	18.4	10.8
TYPE A Cyan	Steamed	D65	10	45.7	-34.0	-61.8	36.7	14.4
TYPE A Blue	Steamed	D65	10	25.0	3.6	-18.1	5.1	-2.7
TYPE A Black	Steamed	D65	10	21.0	2.0	-12.2	4.4	-3.6
TYPE A Lavendar	Steamed	D65	10	22.9	13.3	-12.4	6.7	-3.6
TYPE A Burgundy	Steamed & Washed	D65	10	25.7	23.7	2.6	0.8	-0.7
TYPE A Magenta	Steamed & Washed	D65	10	33.9	51.0	12.9	1.9	1.0
TYPE A Orange	Steamed & Washed	D65	10	41.2	50.0	31.9	1.8	-0.4
TYPE A Red	Steamed & Washed	D65	10	34.9	50.4	20.6	1.8	0.5
TYPE A Yellow	Steamed & Washed	D65	10	85.8	-3.2	98.1	2.1	1.8
TYPE A Green	Steamed & Washed	D65	10	60.2	-37.8	58.8	2.7	2.2
TYPE A Cyan	Steamed & Washed	D65	10	44.7	-28.1	-27.9	0.9	0.6
TYPE A Blue	Steamed & Washed	D65	10	24.8	4.5	-18.4	1.1	1.0
TYPE A Black	Steamed & Washed	D65	10	20.7	2.3	-12.3	0.3	0.2
TYPE A Lavendar	Steamed & Washed	D65	10	22.9	13.8	-12.4	0.5	0.4
TYPE A Burgundy	Steamed & Detergent Washed	D65	10	26.9	24.6	1.6	1.8	-1.7
TYPE A Magenta	Steamed & Detergent Washed	D65	10	35.0	52.3	11.5	2.9	-0.6
TYPE A Orange	Steamed & Detergent Washed	D65	10	41.5	50.8	32.7	2.4	-0.1
TYPE A Red	Steamed & Detergent Washed	D65	10	35.6	51.7	20.0	2.7	-0.5
TYPE A Yellow	Steamed & Detergent Washed	D65	10	86.0	-3.5	99.7	2.0	1.9
TYPE A Green	Steamed & Detergent Washed	D65	10	61.0	-39.0	60.7	2.2	2.1
TYPE A Cyan	Steamed & Detergent Washed	D65	10	45.5	-27.8	-29.2	2.0	1.7
TYPE A Blue	Steamed & Detergent Washed	D65	10	24.9	4.5	-19.3	1.8	0.8
TYPE A Black	Steamed & Detergent Washed	D65	10					
TYPE A Lavendar	Steamed & Detergent Washed	D65	10					

6015741 - 11045

6016374-110499

320 419 0430

		CIE						
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE B Burgundy Standard		D65	10	30.3	28.4	3.7		
TYPE B Magenta Standard		D65	10	35.2	48.2	9.5		
TYPE B Orange Standard		D65	10	44.9	42.8	27.2		
TYPE B Red Standard		D65	10	36.7	47.9	16.4		
TYPE B Yellow Standard		D65	10	84.4	6.1	85.6		
TYPE B Green Standard		D65	10	62.2	-21.7	52.9		
TYPE B Cyan Standard		D65	10	48.6	-25.4	-24.0		
TYPE B Blue Standard		D65	10	30.6	6.2	-15.7		
TYPE B Black Standard		D65	10	24.0	7.2	-12.5		
TYPE B Lavender Standard		D65	10	27.7	18.4	-9.3		
TYPE B Burgundy	Water Washed	D65	10	29.1	28.9	0.8	3.2	-2.8
TYPE B Magenta	Water Washed	D65	10	34.7	49.2	9.7	1.2	0.0
TYPE B Orange	Water Washed	D65	10	43.0	43.9	26.1	2.8	-1.6
TYPE B Red	Water Washed	D65	10	35.7	48.4	15.3	1.6	-1.2
TYPE B Yellow	Water Washed	D65	10	80.1	-1.3	79.9	10.3	7.2
TYPE B Green	Water Washed	D65	10	60.6	-34.5	49.8	13.2	12.7
TYPE B Cyan	Water Washed	D65	10	47.5	-33.4	-23.6	8.1	-5.4
TYPE B Blue	Water Washed	D65	10	27.3	3.7	-18.7	5.2	-3.2
TYPE B Black	Water Washed	D65	10	23.3	3.4	-14.1	4.2	-4.1
TYPE B Lavendar	Water Washed	D65	10	25.3	17.3	-11.8	3.7	-2.8
TYPE B Burgundy	Detergent Washed	D65	10	30.8	28.3	-1.7	5.8	5.3
TYPE B Magenta	Detergent Washed	D65	10	35.9	47.8	5.7	3.9	-3.7
TYPE B Orange	Detergent Washed	D65	10	43.3	40.9	19.1	8.4	-6.3
TYPE B Red	Detergent Washed	D65	10	38.1	47.0	9.1	7.5	-6.9
TYPE B Yellow	Detergent Washed	D65	10	76.6	-1.1	69.2	19.5	6.7
TYPE B Green	Detergent Washed	D65	10	60.5	-24.5	24.6	30.6	17.4
TYPE B Cyan	Detergent Washed	D65	10	46.3	-30.9	-25.4	8.2	-2.8
TYPE B Blue	Detergent Washed	D65	10	28.2	4.2	-20.6	5.9	-3.3
TYPE B Black	Detergent Washed	D65	10	26.6	2.4	-16.9	7.0	-5.9
TYPE B Lavendar	Detergent Washed	D65	10	27.7	17.4	-14.7	5.5	-5.0
TYPE B Burgundy	Steamed	D65	10	26.3	24.9	2.2	6.2	-1.0
TYPE B Magenta	Steamed	D65	10	33.8	48.9	9.9	1.8	0.3
TYPE B Orange	Steamed	D65	10	39.8	47.1	30.0	7.4	0.0
TYPE B Red	Steamed	D65	10	34.3	48.4	18.3	3.2	1.7
TYPE B Yellow	Steamed	D65	10	86.2	-1.8	101.6	17.9	8.3
TYPE B Green	Steamed	D65	10	58.8	-40.8	56.9	19.7	14.6
TYPE B Cyan	Steamed	D65	10	44.6	-27.2	-27.8	5.8	1.5
TYPE B Blue	Steamed	D65	10	26.3	3.7	-18.2	5.6	-3.1
TYPE B Black	Steamed	D65	10	23.5	2.2	-13.2	5.1	-4.9
TYPE B Lavendar	Steamed	D65	10	24.3	15.2	-12.6	5.7	-4.6
TYPE B Burgandy	Steamed & Washed	D65	10	28.97	28.24	3.47	1.94	1.03
TYPE B Magenta	Steamed & Washed	D65	10	33.52	50.23	11.94	1.78	1.23
TYPE B Orange	Steamed & Washed	D65	10	40.79	48.01	30.36	1.51	-0.13
TYPE B Red	Steamed & Washed	D65	10	34.52	48.89	18.83	0.52	0.01
TYPE B Yellow	Steamed & Washed	D65	10	86.35	-3.71	97.90	3.95	1.92
TYPE B Green	Steamed & Washed	D65	10	60.98	-42.13	57.56	2.56	0.40
TYPE B Cyan	Steamed & Washed	D65	10	44.86	-27.54	-28.52	0.94	0.84
TYPE B Blue	Steamed & Washed	D65	10	26.43	4.76	-19.09	1.02	0.28
TYPE B Black	Steamed & Washed	D65	10	23.09	2.57	-13.17	0.61	0.60
TYPE B Lavendar	Steamed & Washed	D65	10	23.91	15.43	-12.23	0.52	0.39
TYPE B Burgandy	Steamed & Detergent Washed	D65	10	26.71	25.98	2.09	1.20	-0.28
TYPE B Magenta	Steamed & Detergent Washed	D65	10	33.68	51.47	11.84	7.85	-7.80
TYPE B Orange	Steamed & Detergent Washed	D65	10	40.71	48.85	31.49	2.67	0.38
TYPE B Red	Steamed & Detergent Washed	D65	10	34.58	49.67	18.81	1.20	-0.29
TYPE B Yellow	Steamed & Detergent Washed	D65	10	88.37	-3.72	99.19	2.88	1.89
TYPE B Green	Steamed & Detergent Washed	D65	10	59.77	-42.47	57.66	1.72	0.80
TYPE B Cyan	Steamed & Detergent Washed	D65	10	45.86	-27.60	-28.53	1.48	0.81
TYPE B Blue	Steamed & Detergent Washed	D65	10	26.25	5.85	-19.38	1.76	1.02
TYPE B Black	Steamed & Detergent Washed	D65	10	23.51	3.52	-13.98	1.58	1.38
TYPE B Lavendar	Steamed & Detergent Washed	D65	10	23.73	16.15	-12.65	0.98	0.52

		CIE						
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE C Burgundy Standard		D65	10	28.4	31.0	4.4		
TYPE C Magenta Standard		D65	10	35.1	53.4	10.8		
TYPE C Orange Standard		D65	10	43.7	48.2	32.1		
TYPE C Red Standard		D65	10	36.8	52.0	19.5		
TYPE C Yellow Standard		D65	10	84.7	5.1	94.8		
TYPE C Green Standard		D65	10	61.9	-24.6	57.0		
TYPE C Cyan Standard		D65	10	49.3	-25.1	-26.4		
TYPE C Blue Standard		D65	10	29.9	7.6	-16.1		
TYPE C Black Standard		D65	10	24.9	7.5	-13.8		
TYPE C Lavendar Standard		D65	10	26.8	20.4	-12.9		
TYPE C Burgundy	Water Washed	D65	10	51.2	30.5	-11.4	27.7	15.7
TYPE C Magenta	Water Washed	D65	10	56.8	51.1	-4.9	26.9	15.6
TYPE C Orange	Water Washed	D65	10	66.8	33.2	6.6	37.5	-17.3
TYPE C Red	Water Washed	D65	10	58.6	46.6	0.6	29.3	-17.5
TYPE C Yellow	Water Washed	D65	10	86.8	-6.8	25.8	70.0	15.6
TYPE C Green	Water Washed	D65	10	79.2	-29.1	17.4	43.4	28.2
TYPE C Cyan	Water Washed	D65	10	69.7	-30.9	-22.2	21.8	-7.0
TYPE C Blue	Water Washed	D65	10	52.4	6.0	-25.5	23.8	-3.8
TYPE C Black	Water Washed	D65	10	43.0	2.9	-23.9	21.2	-7.2
TYPE C Lavendar	Water Washed	D65	10	46.1	19.1	-22.4	23.4	-8.0
TYPE C Burgundy	Detergent Washed	D65	10	58.3	21.4	-11.3	35.1	16.9
TYPE C Magenta	Detergent Washed	D65	10	61.4	42.3	-6.4	33.2	16.7
TYPE C Orange	Detergent Washed	D65	10	71.2	25.2	5.4	44.7	-14.5
TYPE C Red	Detergent Washed	D65	10	65.6	37.1	-0.4	36.2	16.8
TYPE C Yellow	Detergent Washed	D65	10	89.5	-5.4	19.9	75.8	14.0
TYPE C Green	Detergent Washed	D65	10	79.8	-26.6	10.7	49.7	32.1
TYPE C Cyan	Detergent Washed	D65	10	71.4	-30.4	-20.1	23.6	-8.3
TYPE C Blue	Detergent Washed	D65	10	60.1	-1.3	-23.4	31.9	-9.6
TYPE C Black	Detergent Washed	D65	10	51.6	-4.7	-24.2	31.1	-13.3
TYPE C Lavendar	Detergent Washed	D65	10	55.7	11.2	-21.9	31.6	-12.9
TYPE C Burgundy	Steamed	D65	10	25.5	28.6	1.5	4.8	-2.7
TYPE C Magenta	Steamed	D65	10	34.3	55.9	11.7	2.9	0.4
TYPE C Orange	Steamed	D65	10	41.3	52.4	35.9	6.2	0.7
TYPE C Red	Steamed	D65	10	35.1	54.3	22.2	3.9	1.6
TYPE C Yellow	Steamed	D65	10	86.0	-2.4	101.7	10.3	7.6
TYPE C Green	Steamed	D65	10	69.8	-46.3	58.5	20.9	17.0
TYPE C Cyan	Steamed	D65	10	46.8	-29.5	-30.5	6.6	-0.4
TYPE C Blue	Steamed	D65	10	25.2	6.2	-23.6	7.3	-3.0
TYPE C Black	Steamed	D65	10	21.6	4.4	-16.2	4.9	-3.7
TYPE C Lavendar	Steamed	D65	10	22.7	16.9	-16.6	6.7	-3.9
TYPE C Burgundy	Steamed & Washed	D65	10	27.4	31.7	1.0	4.1	-0.5
TYPE C Magenta	Steamed & Washed	D65	10	37.8	59.4	9.4	5.5	-2.9
TYPE C Orange	Steamed & Washed	D65	10	44.8	52.3	37.9	3.9	1.8
TYPE C Red	Steamed & Washed	D65	10	38.4	57.1	23.5	4.4	-0.1
TYPE C Yellow	Steamed & Washed	D65	10	88.1	-8.8	95.9	8.9	6.8
TYPE C Green	Steamed & Washed	D65	10	62.4	-52.2	66.7	7.5	6.3
TYPE C Cyan	Steamed & Washed	D65	10	49.3	-31.0	-31.1	3.1	-0.6
TYPE C Blue	Steamed & Washed	D65	10	27.7	7.0	-26.0	3.7	-0.2
TYPE C Black	Steamed & Washed	D65	10	23.8	5.5	-18.9	3.7	0.2
TYPE C Lavendar	Steamed & Washed	D65	10	25.5	22.0	-19.5	5.3	-0.2
TYPE C Burgundy	Steamed & Detergent Washed	D65	10	27.2	31.3	0.6	3.7	-0.9
TYPE C Magenta	Steamed & Detergent Washed	D65	10	37.0	59.0	9.7	4.7	-2.6
TYPE C Orange	Steamed & Detergent Washed	D65	10	44.9	51.2	39.3	4.3	2.6
TYPE C Red	Steamed & Detergent Washed	D65	10	39.1	56.7	21.7	4.8	-1.5
TYPE C Yellow	Steamed & Detergent Washed	D65	10	86.6	-6.6	96.0	7.4	4.8
TYPE C Green	Steamed & Detergent Washed	D65	10	62.0	-52.1	56.2	7.5	6.6
TYPE C Cyan	Steamed & Detergent Washed	D65	10	49.1	-31.7	-30.7	3.3	-1.4
TYPE C Blue	Steamed & Detergent Washed	D65	10	27.8	6.8	-25.9	3.7	-0.4
TYPE C Black	Steamed & Detergent Washed	D65	10	23.9	4.9	-19.0	3.8	-0.3
TYPE C Lavendar	Steamed & Detergent Washed	D65	10	24.7	21.8	-19.8	5.1	-0.5

6016374-JL0499

		CIE						
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE D Burgundy Standard		D65	10	28.3	27.8	2.8		
TYPE D Magenta Standard		D65	10	34.7	50.3	11.4		
TYPE D Orange Standard		D65	10	44.5	43.9	27.2		
TYPE D Red Standard		D65	10	36.7	48.2	16.2		
TYPE D Yellow Standard		D65	10	84.2	4.8	86.9		
TYPE D Green Standard		D65	10	61.7	-24.8	52.9		
TYPE D Cyan Standard		D65	10	49.7	-25.9	-23.8		
TYPE D Blue Standard		D65	10	30.7	7.5	-16.8		
TYPE D Black Standard		D65	10	22.4	9.0	-13.5		
TYPE D Lavendar Standard		D65	10	28.8	17.8	-11.2		
TYPE D Burgundy	Water Washed	D65	10	28.0	27.8	1.3	1.8	-1.4
TYPE D Magenta	Water Washed	D65	10	36.0	52.7	13.0	3.1	0.9
TYPE D Orange	Water Washed	D65	10	42.8	50.2	28.2	6.6	-2.4
TYPE D Red	Water Washed	D65	10	37.2	51.8	16.9	3.7	-0.5
TYPE D Yellow	Water Washed	D65	10	87.0	-7.5	93.6	14.7	12.2
TYPE D Green	Water Washed	D65	10	64.8	-44.3	58.2	20.7	14.1
TYPE D Cyan	Water Washed	D65	10	54.1	-33.3	-29.3	10.4	-0.7
TYPE D Blue	Water Washed	D65	10	28.4	9.5	-22.6	6.5	-0.4
TYPE D Black	Water Washed	D65	10	22.2	7.5	-15.8	2.8	-2.5
TYPE D Lavendar	Water Washed	D65	10	26.3	18.8	-14.6	4.3	-2.2
TYPE D Burgundy	Detergent Washed	D65	10	29.1	29.6	-2.5	5.6	5.3
TYPE D Magenta	Detergent Washed	D65	10	37.2	52.3	6.7	5.7	-5.0
TYPE D Orange	Detergent Washed	D65	10	43.2	48.7	25.8	5.1	-3.6
TYPE D Red	Detergent Washed	D65	10	37.7	52.0	14.1	4.6	-3.1
TYPE D Yellow	Detergent Washed	D65	10	85.1	-6.7	89.4	12.1	11.5
TYPE D Green	Detergent Washed	D65	10	62.8	-43.9	53.3	19.4	16.1
TYPE D Cyan	Detergent Washed	D65	10	52.8	-32.7	-28.9	9.2	-0.8
TYPE D Blue	Detergent Washed	D65	10	28.7	9.3	-23.1	6.8	-0.7
TYPE D Black	Detergent Washed	D65	10	23.6	7.7	-17.8	4.5	-3.1
TYPE D Lavendar	Detergent Washed	D65	10	27.1	19.1	-16.4	5.8	-3.4
TYPE D Burgundy	Steamed	D65	10	28.2	28.8	4.4	2.8	1.8
TYPE D Magenta	Steamed	D65	10	34.8	53.1	13.7	3.6	1.5
TYPE D Orange	Steamed	D65	10	41.8	50.3	33.9	9.6	2.2
TYPE D Red	Steamed	D65	10	35.8	52.2	21.6	6.9	3.7
TYPE D Yellow	Steamed	D65	10	85.8	0.1	100.6	15.4	5.1
TYPE D Green	Steamed	D65	10	61.7	-30.0	60.6	9.4	1.6
TYPE D Cyan	Steamed	D65	10	49.2	-25.9	-24.7	1.2	0.9
TYPE D Blue	Steamed	D65	10	27.4	9.5	-18.2	4.1	1.2
TYPE D Black	Steamed	D65	10	21.4	8.6	-12.6	1.4	0.2
TYPE D Lavendar	Steamed	D65	10	24.4	19.0	-11.3	4.5	0.8
TYPE D Burgundy	Steamed & Washed	D65	10	28.8	28.0	4.1	1.1	-0.4
TYPE D Magenta	Steamed & Washed	D65	10	34.4	50.9	13.0	2.5	-0.2
TYPE D Orange	Steamed & Washed	D65	10	40.7	49.4	32.4	2.0	-0.8
TYPE D Red	Steamed & Washed	D65	10	34.8	50.5	20.8	2.0	-0.1
TYPE D Yellow	Steamed & Washed	D65	10	85.6	-5.3	97.0	6.1	5.4
TYPE D Green	Steamed & Washed	D65	10	61.8	-41.0	57.7	11.2	10.7
TYPE D Cyan	Steamed & Washed	D65	10	48.9	-30.0	-28.4	5.8	-0.1
TYPE D Blue	Steamed & Washed	D65	10	26.8	8.8	-21.0	3.2	-2.3
TYPE D Black	Steamed & Washed	D65	10	21.2	5.7	-13.1	2.9	-2.8
TYPE D Lavendar	Steamed & Washed	D65	10	23.9	17.8	-12.2	1.7	-1.5
TYPE D Burgundy	Steamed & Detergent Washed	D65	10	28.4	28.3	-0.8	5.9	5.4
TYPE D Magenta	Steamed & Detergent Washed	D65	10	35.4	51.2	6.8	7.3	-6.4
TYPE D Orange	Steamed & Detergent Washed	D65	10	41.6	45.9	27.9	7.3	-2.7
TYPE D Red	Steamed & Detergent Washed	D65	10	36.6	49.8	14.6	7.5	-5.7
TYPE D Yellow	Steamed & Detergent Washed	D65	10	82.9	-8.0	87.5	15.2	8.5
TYPE D Green	Steamed & Detergent Washed	D65	10	61.5	-42.3	54.9	13.4	13.3
TYPE D Cyan	Steamed & Detergent Washed	D65	10	49.2	-30.5	-25.7	4.8	-2.3
TYPE D Blue	Steamed & Detergent Washed	D65	10	27.2	8.9	-21.8	3.7	-2.4
TYPE D Black	Steamed & Detergent Washed	D65	10	23.0	6.8	-16.1	4.8	-3.4
TYPE D Lavendar	Steamed & Detergent Washed	D65	10	25.2	18.5	-15.5	4.4	-3.8

6015374.1104999

			CIE				
Sample name	Time	Illum	Angle	L*	a*	b*	DE*
TYPE E Burgundy Standard		D65	10	29.3	28.3	3.0	
TYPE E Magenta Standard		D65	10	35.3	47.6	9.2	
TYPE E Orange Standard		D65	10	45.0	42.7	26.1	
TYPE E Red Standard		D65	10	36.8	46.9	15.6	
TYPE E Yellow Standard		D65	10	83.9	5.7	83.2	
TYPE E Green Standard		D65	10	62.3	-23.2	53.9	
TYPE E Cyan Standard		D65	10	50.6	-24.5	-24.6	
TYPE E Blue Standard		D65	10	31.8	8.2	-16.3	
TYPE E Black Standard		D65	10	22.2	9.0	-12.2	
TYPE E Lavendar Standard		D65	10	30.2	18.1	-9.7	
TYPE E Burgundy	Water Washed	D65	10	28.7	30.4	-0.2	3.8
TYPE E Magenta	Water Washed	D65	10	35.9	52.3	9.2	4.7
TYPE E Orange	Water Washed	D65	10	42.6	48.1	24.4	6.0
TYPE E Red	Water Washed	D65	10	37.0	52.0	15.4	5.1
TYPE E Yellow	Water Washed	D65	10	83.5	-4.4	85.4	10.3
TYPE E Green	Water Washed	D65	10	65.5	-41.8	56.9	19.0
TYPE E Cyan	Water Washed	D65	10	55.6	-34.4	-27.4	11.4
TYPE E Blue	Water Washed	D65	10	28.7	10.7	-22.2	7.2
TYPE E Black	Water Washed	D65	10	23.2	8.5	-16.2	4.2
TYPE E Lavendar	Water Washed	D65	10	27.1	20.5	-14.9	6.5
TYPE E Burgundy	Detergent Washed	D65	10	33.0	28.3	-6.0	6.8
TYPE E Magenta	Detergent Washed	D65	10	40.1	50.9	2.1	9.1
TYPE E Orange	Detergent Washed	D65	10	48.4	44.5	16.9	7.2
TYPE E Red	Detergent Washed	D65	10	41.5	49.4	7.0	10.1
TYPE E Yellow	Detergent Washed	D65	10	82.3	-5.7	70.4	17.2
TYPE E Green	Detergent Washed	D65	10	64.5	-40.6	43.6	20.4
TYPE E Cyan	Detergent Washed	D65	10	54.7	-32.5	-26.5	9.1
TYPE E Blue	Detergent Washed	D65	10	33.9	9.3	-25.2	9.2
TYPE E Black	Detergent Washed	D65	10	27.6	6.7	-20.9	10.6
TYPE E Lavendar	Detergent Washed	D65	10	32.2	19.6	-19.2	9.8
TYPE E Burgundy	Steamed	D65	10	26.5	29.2	5.4	3.8
TYPE E Magenta	Steamed	D65	10	33.9	52.0	13.9	6.6
TYPE E Orange	Steamed	D65	10	41.9	47.8	32.1	9.1
TYPE E Red	Steamed	D65	10	35.0	51.1	20.9	7.0
TYPE E Yellow	Steamed	D65	10	85.0	2.7	86.8	14.0
TYPE E Green	Steamed	D65	10	61.6	-26.8	58.7	6.1
TYPE E Cyan	Steamed	D65	10	49.6	-25.6	-24.9	1.4
TYPE E Blue	Steamed	D65	10	29.6	9.3	-16.7	2.5
TYPE E Black	Steamed	D65	10	21.8	8.6	-11.7	0.7
TYPE E Lavendar	Steamed	D65	10	28.3	19.5	-9.8	4.2
TYPE E Burgundy	Steamed & Washed	D65	10	28.0	28.6	4.1	1.5
TYPE E Magenta	Steamed & Washed	D65	10	33.6	51.3	13.0	0.9
TYPE E Orange	Steamed & Washed	D65	10	40.2	46.9	30.0	2.7
TYPE E Red	Steamed & Washed	D65	10	34.4	50.5	19.9	1.4
TYPE E Yellow	Steamed & Washed	D65	10	82.3	-5.6	86.9	11.7
TYPE E Green	Steamed & Washed	D65	10	62.3	-39.3	57.2	13.0
TYPE E Cyan	Steamed & Washed	D65	10	51.0	-32.7	-27.8	7.7
TYPE E Blue	Steamed & Washed	D65	10	26.4	8.8	-20.1	4.7
TYPE E Black	Steamed & Washed	D65	10	20.9	7.4	-13.6	2.4
TYPE E Lavendar	Steamed & Washed	D65	10	23.7	16.2	-10.7	3.1
TYPE E Burgundy	Steamed & Detergent Washed	D65	10	27.6	30.1	1.4	4.4
TYPE E Magenta	Steamed & Detergent Washed	D65	10	35.2	52.5	8.9	5.0
TYPE E Orange	Steamed & Detergent Washed	D65	10	42.6	46.8	28.6	3.4
TYPE E Red	Steamed & Detergent Washed	D65	10	36.3	51.4	17.1	4.1
TYPE E Yellow	Steamed & Detergent Washed	D65	10	84.7	-8.2	87.5	14.3
TYPE E Green	Steamed & Detergent Washed	D65	10	64.6	-42.1	57.8	15.9
TYPE E Cyan	Steamed & Detergent Washed	D65	10	51.6	-33.3	-26.0	8.0
TYPE E Blue	Steamed & Detergent Washed	D65	10	27.5	9.4	-21.0	4.9
TYPE E Black	Steamed & Detergent Washed	D65	10	22.2	7.0	-15.2	4.1
TYPE E Lavendar	Steamed & Detergent Washed	D65	10	24.5	16.8	-13.4	4.2

60153744 .110499

3/4 423

0424

6016374.110499

DH*
3.2
-0.8
-3.3
-1.7
10.1
15.1
-4.4
-0.4
-2.6
-3.1
8.9
-7.4
-7.0
-8.9
11.4
20.3
-3.9
-2.5
-5.9
-6.7
2.3
3.7
3.2
3.6
3.7
1.3
-0.5
0.8
0.0
0.7
-1.2
-0.5
-1.3
-0.7
8.1
12.0
-2.6
-1.7
-2.2
-1.5
-4.2
-4.8
-2.5
-3.7
11.0
14.0
-4.3
-1.7
-3.3
-3.6

			CIE					
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE F Burgundy Standard		D65	10	30.1	29.6	2.5		
TYPE F Magenta Standard		D65	10	36.4	50.9	9.2		
TYPE F Orange Standard		D65	10	44.9	45.4	28.7		
TYPE F Red Standard		D65	10	37.4	49.8	16.8		
TYPE F Yellow Standard		D65	10	84.6	5.2	92.3		
TYPE F Green Standard		D65	10	60.1	-26.6	53.7		
TYPE F Cyan Standard		D65	10	48.5	-27.0	-21.5		
TYPE F Blue Standard		D65	10	31.1	6.8	-17.6		
TYPE F Black Standard		D65	10	24.2	7.9	-14.0		
TYPE F Lavendar Standard		D65	10	29.2	18.2	-12.4		
TYPE F Burgundy	Water Washed	D65	10	28.8	29.5	0.9	2.1	-1.8
TYPE F Magenta	Water Washed	D65	10	36.3	52.7	11.0	2.5	1.4
TYPE F Orange	Water Washed	D65	10	42.8	49.7	30.9	5.3	-0.4
TYPE F Red	Water Washed	D65	10	36.7	52.2	18.8	3.1	1.1
TYPE F Yellow	Water Washed	D65	10	85.9	-5.7	94.3	11.1	10.9
TYPE F Green	Water Washed	D65	10	61.9	-42.1	56.2	15.9	11.9
TYPE F Cyan	Water Washed	D65	10	51.8	-31.7	-29.4	9.8	2.9
TYPE F Blue	Water Washed	D65	10	27.8	7.4	-22.2	5.7	-1.0
TYPE F Black	Water Washed	D65	10	22.4	6.5	-15.0	2.5	-1.8
TYPE F Lavendar	Water Washed	D65	10	26.0	18.0	-15.5	4.5	-2.8
TYPE F Burgundy	Detergent Washed	D65	10	27.6	29.0	1.5	2.8	-1.0
TYPE F Magenta	Detergent Washed	D65	10	35.7	52.6	10.3	2.2	0.8
TYPE F Orange	Detergent Washed	D65	10	42.9	49.3	29.8	4.5	-1.1
TYPE F Red	Detergent Washed	D65	10	36.9	51.6	17.8	2.0	0.2
TYPE F Yellow	Detergent Washed	D65	10	85.7	-4.5	94.3	9.9	9.7
TYPE F Green	Detergent Washed	D65	10	59.4	-38.9	65.1	12.5	9.9
TYPE F Cyan	Detergent Washed	D65	10	50.1	-27.4	-30.3	9.0	6.2
TYPE F Blue	Detergent Washed	D65	10	27.0	8.0	-21.9	6.0	-0.3
TYPE F Black	Detergent Washed	D65	10	21.9	7.5	-16.1	3.1	-1.3
TYPE F Lavendar	Detergent Washed	D65	10	26.0	18.2	-15.9	4.8	-2.8
TYPE F Burgundy	Steamed	D65	10	27.3	30.5	4.3	3.4	1.7
TYPE F Magenta	Steamed	D65	10	35.3	54.2	12.6	4.8	2.7
TYPE F Orange	Steamed	D65	10	42.1	50.5	35.6	9.1	3.0
TYPE F Red	Steamed	D65	10	36.2	53.0	21.9	6.1	3.6
TYPE F Yellow	Steamed	D65	10	86.6	-1.9	105.6	15.1	7.3
TYPE F Green	Steamed	D65	10	60.2	-35.3	63.4	13.1	3.2
TYPE F Cyan	Steamed	D65	10	47.8	-27.4	-24.0	2.6	1.7
TYPE F Blue	Steamed	D65	10	27.0	9.1	-18.4	4.8	1.8
TYPE F Black	Steamed	D65	10	22.8	7.4	-13.1	1.8	0.0
TYPE F Lavendar	Steamed	D65	10	25.5	19.3	-13.2	3.9	-0.1
TYPE F Burgundy	Steamed & Washed	D65	10	28.1	29.8	3.9	1.2	-0.9
TYPE F Magenta	Steamed & Washed	D65	10	35.9	53.9	11.5	0.6	-0.1
TYPE F Orange	Steamed & Washed	D65	10	42.4	50.7	35.5	1.9	-1.0
TYPE F Red	Steamed & Washed	D65	10	36.2	52.8	21.7	0.9	-0.8
TYPE F Yellow	Steamed & Washed	D65	10	84.7	-0.6	100.0	6.2	-1.3
TYPE F Green	Steamed & Washed	D65	10	59.5	-35.9	59.5	5.0	3.2
TYPE F Cyan	Steamed & Washed	D65	10	47.5	-26.5	-26.8	2.9	2.6
TYPE F Blue	Steamed & Washed	D65	10	26.9	8.5	-19.8	1.5	-1.2
TYPE F Black	Steamed & Washed	D65	10	22.9	6.0	-13.7	1.4	-1.4
TYPE F Lavender	Steamed & Washed	D65	10	25.8	18.9	-13.7	0.8	-0.7
TYPE F Burgundy	Steamed & Detergent Washed	D65	10	28.9	28.3	-1.1	6.8	6.8
TYPE F Magenta	Steamed & Detergent Washed	D65	10	37.8	53.7	8.2	6.0	-5.4
TYPE F Orange	Steamed & Detergent Washed	D65	10	45.6	45.9	30.7	9.2	-2.3
TYPE F Red	Steamed & Detergent Washed	D65	10	39.3	51.2	15.9	7.3	-5.6
TYPE F Yellow	Steamed & Detergent Washed	D65	10	83.2	-0.3	92.6	13.8	-1.8
TYPE F Green	Steamed & Detergent Washed	D65	10	59.7	-38.0	55.2	6.8	6.8
TYPE F Cyan	Steamed & Detergent Washed	D65	10	45.8	-28.2	-21.1	3.6	-2.8
TYPE F Blue	Steamed & Detergent Washed	D65	10	27.2	8.1	-19.4	1.6	-1.5
TYPE F Black	Steamed & Detergent Washed	D65	10	23.0	5.1	-14.0	2.4	-2.4
TYPE F Lavendar	Steamed & Detergent Washed	D65	10	26.2	18.8	-16.0	2.9	-2.6

05637411.1104499

		CIE						
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE G Burgundy Standard		D65	10	32.3	27.1	1.8		
TYPE G Magenta Standard		D65	10	37.2	44.4	5.6		
TYPE G Orange Standard		D65	10	46.7	39.1	22.7		
TYPE G Red Standard		D65	10	38.7	43.5	12.3		
TYPE G Yellow Standard		D65	10	82.6	6.0	79.6		
TYPE G Green Standard		D65	10	62.2	-20.6	49.4		
TYPE G Cyan Standard		D65	10	50.9	-24.9	-18.3		
TYPE G Blue Standard		D65	10	36.3	6.2	-14.2		
TYPE G Black Standard		D65	10	26.6	0.9	-12.3		
TYPE G Lavender Standard		D65	10	33.9	18.1	-9.9		
TYPE G Burgundy	Water Washed	D65	10	28.9	31.4	0.0	5.8	2.0
TYPE G Magenta	Water Washed	D65	10	37.5	55.7	9.2	11.8	1.9
TYPE G Orange	Water Washed	D65	10	44.6	50.6	28.7	13.2	-0.5
TYPE G Red	Water Washed	D75	10	37.6	44.2	-5.6	17.9	17.9
TYPE G Yellow	Water Washed	D65	10	86.3	-6.1	90.8	16.8	12.1
TYPE G Green	Water Washed	D65	10	65.1	-40.7	58.4	22.1	13.1
TYPE G Cyan	Water Washed	D65	10	51.8	-30.5	-28.6	11.7	4.3
TYPE G Blue	Water Washed	D65	10	28.9	9.9	-22.8	12.0	0.0
TYPE G Black	Water Washed	D65	10	22.8	8.4	-15.8	5.2	-2.3
TYPE G Lavendar	Water Washed	D65	10	26.8	21.2	-16.9	10.4	-4.0
TYPE G Burgundy	Detergent Washed	D65	10	31.9	28.3	-4.8	6.7	6.8
TYPE G Magenta	Detergent Washed	D65	10	38.7	48.7	2.8	8.3	-3.2
TYPE G Orange	Detergent Washed	D65	10	45.5	40.7	17.9	5.2	-5.0
TYPE G Red	Detergent Washed	D65	10	39.9	46.5	7.9	5.4	-4.9
TYPE G Yellow	Detergent Washed	D65	10	72.4	2.7	80.5	21.9	2.1
TYPE G Green	Detergent Washed	D65	10	56.4	-32.5	37.3	17.9	16.4
TYPE G Cyan	Detergent Washed	D65	10	47.1	-25.2	-28.0	6.6	5.6
TYPE G Blue	Detergent Washed	D65	10	31.2	6.6	-21.8	9.2	-2.2
TYPE G Black	Detergent Washed	D65	10	25.2	7.5	-16.5	4.6	-3.3
TYPE G Lavendar	Detergent Washed	D65	10	31.1	17.6	-17.7	8.4	-6.6
TYPE G Burgundy	Steamed	D65	10	29.7	31.3	3.5	5.3	1.4
TYPE G Magenta	Steamed	D65	10	36.4	53.4	11.4	10.9	4.2
TYPE G Orange	Steamed	D65	10	42.9	48.7	32.4	14.2	3.2
TYPE G Red	Steamed	D65	10	37.3	50.9	18.1	9.5	3.3
TYPE G Yellow	Steamed	D65	10	84.8	1.8	95.4	16.5	4.9
TYPE G Green	Steamed	D65	10	62.6	-25.8	59.0	10.9	1.0
TYPE G Cyan	Steamed	D65	10	50.3	-24.6	-21.5	3.3	2.7
TYPE G Blue	Steamed	D65	10	32.9	9.3	-16.9	4.9	2.0
TYPE G Black	Steamed	D65	10	25.0	11.8	-16.9	4.8	0.1
TYPE G Lavendar	Steamed	D65	10	29.5	21.5	-11.0	5.6	0.6
TYPE G Burgundy	Steamed & Washed	D65	10	27.6	30.1	3.8	2.3	-0.2
TYPE G Magenta	Steamed & Washed	D65	10	35.1	53.0	11.4	0.8	0.3
TYPE G Orange	Steamed & Washed	D65	10	42.3	50.5	33.3	1.8	-0.2
TYPE G Red	Steamed & Washed	D65	10	36.0	52.7	20.8	4.2	2.4
TYPE G Yellow	Steamed & Washed	D65	10	83.9	-2.2	92.3	5.0	3.8
TYPE G Green	Steamed & Washed	D65	10	62.6	-38.5	59.3	12.8	10.8
TYPE G Cyan	Steamed & Washed	D65	10	48.8	-28.3	-28.2	6.3	1.1
TYPE G Blue	Steamed & Washed	D65	10	28.5	8.7	-20.4	6.5	-2.8
TYPE G Black	Steamed & Washed	D65	10	22.8	7.6	-14.0	3.7	-2.5
TYPE G Lavendar	Steamed & Washed	D65	10	26.0	21.3	-14.4	4.9	-3.4
TYPE G Burgundy	Steamed & Detergent Washed	D65	10	33.6	28.9	-3.5	8.8	7.4
TYPE G Magenta	Steamed & Detergent Washed	D65	10	41.2	51.4	2.7	10.4	-8.1
TYPE G Orange	Steamed & Detergent Washed	D65	10	48.5	42.5	21.8	14.0	-5.9
TYPE G Red	Steamed & Detergent Washed	D65	10	41.2	49.1	11.0	7.8	-5.8
TYPE G Yellow	Steamed & Detergent Washed	D65	10	80.2	-1.8	84.5	31.5	3.5
TYPE G Green	Steamed & Detergent Washed	D65	10	62.5	-36.5	39.5	22.0	19.3
TYPE G Cyan	Steamed & Detergent Washed	D65	10	48.2	-27.6	-21.9	3.8	-1.5
TYPE G Blue	Steamed & Detergent Washed	D65	10	32.9	6.1	-21.4	8.4	-5.1
TYPE G Black	Steamed & Detergent Washed	D65	10	26.9	6.3	-15.7	4.7	-4.3
TYPE G Lavendar	Steamed & Detergent Washed	D65	10	32.7	17.8	-17.6	8.8	-7.8

60153741-110499

				CIE				
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE H Burgundy Standard		D65	10	29.6	28.9	2.3		
TYPE H Magenta Standard		D65	10	36.0	50.5	9.3		
TYPE H Orange Standard		D65	10	44.6	45.3	29.1		
TYPE H Red Standard		D65	10	37.4	49.2	16.5		
TYPE H Yellow Standard		D65	10	83.7	6.5	91.8		
TYPE H Green Standard		D65	10	60.0	-26.1	54.1		
TYPE H Cyan Standard		D65	10	48.5	-27.4	-20.7		
TYPE H Blue Standard		D65	10	31.0	6.1	-17.3		
TYPE H Black Standard		D65	10	23.7	8.0	-13.5		
TYPE H Lavendar Standard		D65	10	28.6	18.1	-12.0		
TYPE H Burgundy	Water Washed	D65	10	29.5	29.6	-0.1	2.5	2.5
TYPE H Magenta	Water Washed	D65	10	38.7	53.1	10.3	2.8	0.5
TYPE H Orange	Water Washed	D65	10	43.5	50.0	32.0	5.6	-0.1
TYPE H Red	Water Washed	D65	10	37.3	52.7	18.6	4.1	0.8
TYPE H Yellow	Water Washed	D65	10	87.1	-5.7	96.8	12.7	11.2
TYPE H Green	Water Washed	D65	10	62.1	-43.2	57.0	17.4	12.9
TYPE H Cyan	Water Washed	D65	10	51.0	-31.8	-26.6	9.4	3.3
TYPE H Blue	Water Washed	D65	10	28.1	6.7	-21.9	5.5	-0.9
TYPE H Black	Water Washed	D65	10	22.7	6.5	-16.1	2.4	-2.0
TYPE H Lavendar	Water Washed	D65	10	26.7	17.6	-15.6	4.6	-3.1
TYPE H Burgundy	Detergent Washed	D65	10	31.4	27.6	-3.3	6.0	5.6
TYPE H Magenta	Detergent Washed	D65	10	38.0	50.2	4.6	5.1	-4.6
TYPE H Orange	Detergent Washed	D65	10	44.6	44.0	25.6	5.5	-3.9
TYPE H Red	Detergent Washed	D65	10	38.0	49.1	13.2	3.4	-3.2
TYPE H Yellow	Detergent Washed	D65	10	80.8	-4.1	77.8	17.3	9.5
TYPE H Green	Detergent Washed	D65	10	60.0	-40.9	48.6	16.5	16.4
TYPE H Cyan	Detergent Washed	D65	10	49.8	-31.2	-26.5	7.1	2.1
TYPE H Blue	Detergent Washed	D65	10	28.8	6.9	-22.5	5.7	-0.9
TYPE H Black	Detergent Washed	D65	10	23.5	6.7	-16.9	3.6	-2.6
TYPE H Lavendar	Detergent Washed	D65	10	28.6	16.3	-17.4	5.7	-5.2
TYPE H Burgundy	Steamed	D65	10	28.1	30.6	4.4	3.1	1.8
TYPE H Magenta	Steamed	D65	10	35.6	53.9	12.1	4.4	2.0
TYPE H Orange	Steamed	D65	10	43.0	50.2	35.5	8.2	2.8
TYPE H Red	Steamed	D65	10	36.8	52.4	21.0	5.6	3.2
TYPE H Yellow	Steamed	D65	10	85.7	0.7	102.4	11.7	5.1
TYPE H Green	Steamed	D65	10	59.9	-29.4	59.7	6.5	0.4
TYPE H Cyan	Steamed	D65	10	48.0	-26.5	-22.4	2.0	1.9
TYPE H Blue	Steamed	D65	10	29.3	8.3	-18.1	2.9	1.8
TYPE H Black	Steamed	D65	10	23.3	8.1	-12.9	0.7	0.4
TYPE H Lavendar	Steamed	D65	10	28.4	18.9	-12.6	2.5	0.0
TYPE H Burgundy	Steamed & Washed	D65	10	28.6	28.4	3.3	1.2	-0.4
TYPE H Magenta	Steamed & Washed	D65	10	35.4	53.4	12.8	0.8	0.7
TYPE H Orange	Steamed & Washed	D65	10	42.3	51.1	34.9	1.1	-0.8
TYPE H Red	Steamed & Washed	D65	10	36.4	52.2	21.0	0.4	0.1
TYPE H Yellow	Steamed & Washed	D65	10	85.7	-2.4	100.1	4.3	3.4
TYPE H Green	Steamed & Washed	D65	10	60.4	-38.7	58.1	9.5	8.9
TYPE H Cyan	Steamed & Washed	D65	10	47.4	-26.3	-26.3	3.9	3.1
TYPE H Blue	Steamed & Washed	D65	10	27.0	9.1	-20.0	3.3	0.1
TYPE H Black	Steamed & Washed	D65	10	22.1	7.3	-13.9	1.8	-1.0
TYPE H Lavendar	Steamed & Washed	D65	10	25.8	18.7	-13.5	1.2	-0.9
TYPE H Burgundy	Steamed & Detergent Washed	D65	10	28.7	28.2	-0.7	5.3	4.8
TYPE H Magenta	Steamed & Detergent Washed	D65	10	37.4	52.6	7.0	5.4	-4.7
TYPE H Orange	Steamed & Detergent Washed	D65	10	44.0	47.0	31.5	5.3	-1.3
TYPE H Red	Steamed & Detergent Washed	D65	10	38.7	50.6	16.1	5.4	-4.0
TYPE H Yellow	Steamed & Detergent Washed	D65	10	82.8	-1.1	88.8	14.8	2.1
TYPE H Green	Steamed & Detergent Washed	D65	10	59.8	-36.2	53.2	11.0	10.9
TYPE H Cyan	Steamed & Detergent Washed	D65	10	46.3	-28.2	-22.8	2.3	-0.8
TYPE H Blue	Steamed & Detergent Washed	D65	10	28.4	7.4	-20.6	2.8	-1.5
TYPE H Black	Steamed & Detergent Washed	D65	10	24.2	6.8	-15.7	3.7	-3.3
TYPE H Lavendar	Steamed & Detergent Washed	D65	10	27.5	18.0	-15.8	3.5	-3.1

3J7 476-

C0427

6016374.1 JJ0499

Sample name	Time	Illum	Angle	CIE L*	a*	b*	DE*	DH*
TYPE I Burgundy Standard		D65	10	30.5	29.9	2.7		
TYPE I Magenta Standard		D65	10	36.3	47.8	7.3		
TYPE I Orange Standard		D65	10	46.5	40.7	25.0		
TYPE I Red Standard		D65	10	37.8	48.2	14.5		
TYPE I Yellow Standard		D65	10	84.0	5.4	86.2		
TYPE I Green Standard		D65	10	63.3	-22.3	53.5		
TYPE I Cyan Standard		D65	10	52.9	-24.5	-23.0		
TYPE I Blue Standard		D65	10	33.9	8.5	-15.8		
TYPE I Black Standard		D65	10	23.0	10.0	-12.5		
TYPE I Lavendar Standard	Water Washed	D65	10	32.6	19.0	-9.9		
TYPE I Burgundy	Water Washed	D65	10	28.1	30.9	1.1	3.4	-1.6
TYPE I Magenta	Water Washed	D65	10	35.8	53.2	9.1	6.9	0.8
TYPE I Orange	Water Washed	D65	10	43.0	49.2	27.7	9.8	-2.0
TYPE I Red	Water Washed	D65	10	37.2	52.6	16.5	6.8	-0.1
TYPE I Yellow	Water Washed	D65	10	84.4	-4.7	86.3	10.6	10.2
TYPE I Green	Water Washed	D65	10	66.2	-42.0	58.8	20.5	14.5
TYPE I Cyan	Water Washed	D65	10	56.3	-34.5	-27.7	11.5	-3.0
TYPE I Blue	Water Washed	D65	10	30.4	10.5	-22.7	8.1	-1.4
TYPE I Black	Water Washed	D65	10	23.1	9.8	-16.4	3.9	-2.6
TYPE I Lavendar	Detergent Washed	D65	10	27.8	22.3	-16.7	6.9	-4.0
TYPE I Burgundy	Detergent Washed	D65	10	33.3	31.2	-7.1	10.3	6.5
TYPE I Magenta	Detergent Washed	D65	10	39.9	50.6	-0.5	9.1	6.0
TYPE I Orange	Detergent Washed	D65	10	46.6	41.7	16.0	9.0	-6.5
TYPE I Red	Detergent Washed	D65	10	40.9	47.9	5.9	9.3	-5.8
TYPE I Yellow	Detergent Washed	D65	10	76.5	-3.2	60.4	27.3	8.4
TYPE I Green	Detergent Washed	D65	10	62.0	-34.5	39.1	18.9	17.9
TYPE I Cyan	Detergent Washed	D65	10	53.7	-29.0	-28.6	5.7	-0.4
TYPE I Blue	Detergent Washed	D65	10	33.8	9.8	-28.3	10.8	-3.2
TYPE I Black	Detergent Washed	D65	10	26.5	9.3	-21.4	9.6	-5.1
TYPE I Lavendar	Steamed	D65	10	32.7	20.5	-20.4	10.6	-7.5
TYPE I Burgundy	Steamed	D65	10	26.2	30.8	6.2	5.9	3.3
TYPE I Magenta	Steamed	D65	10	33.9	52.4	12.4	7.4	4.0
TYPE I Orange	Steamed	D65	10	42.1	46.9	32.8	10.9	3.1
TYPE I Red	Steamed	D65	10	35.6	50.0	19.7	6.8	3.6
TYPE I Yellow	Steamed	D65	10	85.3	1.5	101.8	17.1	4.5
TYPE I Green	Steamed	D65	10	62.7	-31.1	67.9	16.6	2.2
TYPE I Cyan	Steamed	D65	10	51.5	-27.4	-24.3	3.4	-0.9
TYPE I Blue	Steamed	D65	10	28.9	10.6	-16.7	5.5	1.2
TYPE I Black	Steamed	D65	10	21.5	8.3	-11.5	2.6	-0.8
TYPE I Lavendar	Steamed & Washed	D65	10	25.5	22.3	-10.6	7.7	0.8
TYPE I Burgundy	Steamed & Washed	D65	10	27.2	30.8	6.0	0.9	-0.3
TYPE I Magenta	Steamed & Washed	D65	10	34.3	52.5	12.5	0.7	0.2
TYPE I Orange	Steamed & Washed	D65	10	41.9	48.6	34.6	2.8	0.8
TYPE I Red	Steamed & Washed	D65	10	35.2	51.8	21.8	3.0	1.5
TYPE I Yellow	Steamed & Washed	D65	10	85.1	-0.5	100.8	2.1	1.7
TYPE I Green	Steamed & Washed	D65	10	61.8	-35.3	64.7	4.7	4.7
TYPE I Cyan	Steamed & Washed	D65	10	49.9	-29.1	-25.0	2.6	-0.8
TYPE I Blue	Steamed & Washed	D65	10	27.0	10.1	-17.6	2.0	-0.9
TYPE I Black	Steamed & Washed	D65	10	21.6	5.8	-11.7	2.2	-2.1
TYPE I Lavendar	Steamed & Detergent Washed	D65	10	24.9	21.6	-11.2	0.8	-0.8
TYPE I Burgundy	Steamed & Detergent Washed	D65	10	26.9	31.6	4.7	1.7	-1.7
TYPE I Magenta	Steamed & Detergent Washed	D65	10	34.1	52.6	10.0	2.2	-2.2
TYPE I Orange	Steamed & Detergent Washed	D65	10	42.3	47.0	33.3	0.8	0.5
TYPE I Red	Steamed & Detergent Washed	D65	10	35.6	51.5	19.2	1.6	-0.8
TYPE I Yellow	Steamed & Detergent Washed	D65	10	83.2	-1.1	86.4	6.5	2.4
TYPE I Green	Steamed & Detergent Washed	D65	10	62.1	-34.3	65.0	3.7	3.6
TYPE I Cyan	Steamed & Detergent Washed	D65	10	49.3	-27.9	-23.2	2.7	-1.1
TYPE I Blue	Steamed & Detergent Washed	D65	10	27.2	11.1	-17.6	1.7	-0.2
TYPE I Black	Steamed & Detergent Washed	D65	10	20.7	7.2	-11.4	1.5	-0.7
TYPE I Lavendar		D65	10	24.7	22.1	-10.8	0.5	-0.2

5015371-110493

			CIE					
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE J Burgundy Standard		D65	10	32.1	24.4	1.2		
TYPE J Magenta Standard		D65	10	38.8	45.3	6.2		
TYPE J Orange Standard		D65	10	48.8	38.2	24.8		
TYPE J Red Standard		D65	10	39.3	48.1	14.3		
TYPE J Yellow Standard		D65	10	84.4	6.0	84.0		
TYPE J Green Standard		D65	10	63.4	-22.3	55.1		
TYPE J Cyan Standard		D65	10	53.1	-23.7	-22.6		
TYPE J Blue Standard		D65	10	35.9	7.0	-15.1		
TYPE J Black Standard		D65	10	24.6	9.8	-13.0		
TYPE J Lavendar Standard		D65	10	32.6	19.3	-9.8		
TYPE J Burgundy	Water Washed	D65	10	28.1	27.8	-0.9	5.7	2.1
TYPE J Magenta	Water Washed	D65	10	37.3	54.2	6.5	9.3	1.0
TYPE J Orange	Water Washed	D65	10	44.8	48.0	29.4	11.7	-1.1
TYPE J Red	Water Washed	D65	10	38.4	53.8	17.0	8.0	0.4
TYPE J Yellow	Water Washed	D65	10	86.8	-4.5	91.3	12.8	10.5
TYPE J Green	Water Washed	D65	10	65.1	-39.9	59.4	18.1	13.4
TYPE J Cyan	Water Washed	D65	10	54.3	-31.9	-27.4	9.5	-1.9
TYPE J Blue	Water Washed	D65	10	30.0	9.2	-22.2	9.4	-0.8
TYPE J Black	Water Washed	D65	10	23.3	8.7	-16.0	3.5	-2.6
TYPE J Lavendar	Water Washed	D65	10	28.2	21.7	-16.4	8.4	-4.3
TYPE J Burgundy	Detergent Washed	D65	10	27.7	27.5	-0.8	5.8	2.0
TYPE J Magenta	Detergent Washed	D65	10	37.0	53.4	8.3	8.5	0.9
TYPE J Orange	Detergent Washed	D65	10	44.9	47.6	29.7	11.4	-0.7
TYPE J Red	Detergent Washed	D65	10	38.1	52.4	15.8	6.8	-0.4
TYPE J Yellow	Detergent Washed	D65	10	85.0	-4.9	90.5	12.7	11.0
TYPE J Green	Detergent Washed	D65	10	63.7	-40.5	58.2	18.4	14.4
TYPE J Cyan	Detergent Washed	D65	10	54.3	-32.8	-28.2	10.7	-2.0
TYPE J Blue	Detergent Washed	D65	10	30.3	7.8	-22.8	9.5	-2.0
TYPE J Black	Detergent Washed	D65	10	23.3	8.1	-16.3	4.0	-3.2
TYPE J Lavendar	Detergent Washed	D65	10	26.7	20.7	-16.5	9.2	-4.9
TYPE J Burgundy	Steamed	D65	10	28.6	28.2	2.8	4.2	1.4
TYPE J Magenta	Steamed	D65	10	36.3	50.3	9.4	6.4	2.3
TYPE J Orange	Steamed	D65	10	45.6	42.1	30.9	8.2	3.0
TYPE J Red	Steamed	D65	10	37.7	48.7	17.5	4.5	2.2
TYPE J Yellow	Steamed	D65	10	86.1	2.9	85.9	12.3	3.7
TYPE J Green	Steamed	D65	10	62.4	-28.2	60.0	8.3	1.7
TYPE J Cyan	Steamed	D65	10	51.1	-25.4	-23.9	2.9	-0.2
TYPE J Blue	Steamed	D65	10	31.6	8.8	-16.6	4.9	1.0
TYPE J Black	Steamed	D65	10	24.5	47.9	-50.7	53.6	3.7
TYPE J Lavendar	Steamed	D65	10	28.1	21.4	-10.8	5.3	0.0
TYPE J Burgundy	Steamed & Washed	D65	10	27.015	28.128	2.5414	1.9831	-0.083
TYPE J Magenta	Steamed & Washed	D65	10	35.352	51.387	9.8503	1.9071	0.4909
TYPE J Orange	Steamed & Washed	D65	10	43.223	45.387	32.96	4.284	0.0093
TYPE J Red	Steamed & Washed	D65	10	35.898	50.1	19.95	3.2761	1.8032
TYPE J Yellow	Steamed & Washed	D65	10	84.116	-3.606	95.722	8.7888	8.7287
TYPE J Green	Steamed & Washed	D65	10	61.602	-37.76	59.024	11.8	10.482
TYPE J Cyan	Steamed & Washed	D65	10	50.092	-31.33	-26.14	6.8202	-2.243
TYPE J Blue	Steamed & Washed	D65	10	28.01	7.0013	-16.3	4.9737	-2.819
TYPE J Black	Steamed & Washed	D65	10	22.573	6.26	-13.88	3.097	-2.945
TYPE J Lavendar	Steamed & Washed	D65	10	26.273	20.149	-11.83	2.8516	-1.355
TYPE J Burgundy	Steamed & Detergent Washed	D65	10	28.382	27.518	-1.331	4.4231	4.345
TYPE J Magenta	Steamed & Detergent Washed	D65	10	35.35	51.108	5.9885	3.4771	-3.259
TYPE J Orange	Steamed & Detergent Washed	D65	10	43.55	42.812	27.727	3.6087	-2.761
TYPE J Red	Steamed & Detergent Washed	D65	10	36.627	49.178	15.091	2.774	-2.537
TYPE J Yellow	Steamed & Detergent Washed	D65	10	80.671	-5.9	87.42	13.061	9.1517
TYPE J Green	Steamed & Detergent Washed	D65	10	62.404	-39.22	56.422	13.324	12.899
TYPE J Cyan	Steamed & Detergent Washed	D65	10	50.806	-31.84	-25.07	6.6502	-3.297
TYPE J Blue	Steamed & Detergent Washed	D65	10	28.788	7.7008	-20.33	4.8732	-2.412
TYPE J Black	Steamed & Detergent Washed	D65	10	22.886	7.2993	-15.33	3.5173	-2.902
TYPE J Lavendar	Steamed & Detergent Washed	D65	10	26.388	20.921	-14.12	3.8062	-3.112

5015374-JJ0499

3/40 429

CD437

				CIE				
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DH*
TYPE K Burgundy Standard		D65	10	31.4	29.8	3.2		
TYPE K Magenta Standard		D65	10	36.7	48.8	8.0		
TYPE K Orange Standard		D65	10	48.8	41.2	28.5		
TYPE K Red Standard		D65	10	38.6	46.9	15.1		
TYPE K Yellow Standard		D65	10	83.9	5.6	84.5		
TYPE K Green Standard		D65	10	63.1	-22.5	53.6		
TYPE K Cyan Standard		D65	10	52.2	-23.7	-23.6		
TYPE K Burgundy	Water Washed	D65	10	28.1	29.8	2.2	3.4	-1.0
TYPE K Magenta	Water Washed	D65	10	36.2	53.9	9.9	5.5	1.0
TYPE K Orange	Water Washed	D65	10	44.0	46.5	30.4	8.7	-0.8
TYPE K Red	Water Washed	D65	10	37.4	52.6	18.4	8.7	1.3
TYPE K Yellow	Water Washed	D65	10	86.2	-4.5	83.1	13.4	10.1
TYPE K Green	Water Washed	D65	10	64.1	-39.5	57.3	17.5	13.1
TYPE K Cyan	Water Washed	D65	10	53.7	-32.4	-28.0	9.9	-2.6
TYPE K Burgundy	Detergent Washed	D65	10	27.8	31.2	1.8	4.1	-1.5
TYPE K Magenta	Detergent Washed	D65	10	35.5	52.7	8.9	4.1	0.3
TYPE K Orange	Detergent Washed	D65	10	43.4	48.6	28.4	8.6	-1.3
TYPE K Red	Detergent Washed	D65	10	37.6	51.5	15.9	4.8	-0.6
TYPE K Yellow	Detergent Washed	D65	10	80.1	-0.9	82.2	7.8	6.4
TYPE K Green	Detergent Washed	D65	10	62.1	-35.2	53.3	12.8	11.4
TYPE K Cyan	Detergent Washed	D65	10	52.1	-33.2	-24.4	9.8	-5.8
TYPE K Burgundy	Steamed	D65	10	28.9	30.7	5.9	5.3	2.5
TYPE K Magenta	Steamed	D65	10	34.6	52.3	11.8	5.8	3.1
TYPE K Orange	Steamed	D65	10	42.9	46.2	33.3	9.2	2.7
TYPE K Red	Steamed	D65	10	36.0	50.8	20.1	12.3	11.1
TYPE K Yellow	Steamed	D65	10	85.7	0.9	101.7	17.9	5.4
TYPE K Green	Steamed	D65	10	62.5	-28.8	63.4	11.7	1.9
TYPE K Cyan	Steamed	D65	10	50.8	-25.5	-24.8	2.6	-0.4
TYPE K Burgundy	Steamed & Washed	D65	10	28.21	32.12	5.50	1.93	-0.73
TYPE K Magenta	Steamed & Washed	D65	10	34.39	53.01	11.64	0.87	-0.61
TYPE K Orange	Steamed & Washed	D65	10	42.17	48.01	35.66	1.87	0.37
TYPE K Red	Steamed & Washed	D65	10	35.51	51.82	21.85	1.37	0.87
TYPE K Yellow	Steamed & Washed	D65	10	85.24	-0.88	101.98	2.02	1.92
TYPE K Green	Steamed & Washed	D65	10	62.15	-36.18	63.51	7.85	6.67
TYPE K Cyan	Steamed & Washed	D65	10	48.78	-26.90	-25.48	2.80	-0.61
TYPE K Blue	Steamed & Washed	D65	10	28.17	9.89	-17.45	2.54	-0.16
TYPE K Black	Steamed & Washed	D65	10	22.91	7.85	-12.16	0.96	-0.72
TYPE K Lavender	Steamed & Washed	D65	10	28.50	21.70	-11.35	1.88	-0.61
TYPE K Burgundy	Steamed & Detergent Washed	D65	10	28.00	32.12	5.16	1.92	-1.07
TYPE K Magenta	Steamed & Detergent Washed	D65	10	34.06	52.97	11.39	1.07	-0.84
TYPE K Orange	Steamed & Detergent Washed	D65	10	42.43	47.59	36.01	0.96	-0.07
TYPE K Red	Steamed & Detergent Washed	D65	10	35.51	51.77	20.94	0.87	-0.03
TYPE K Yellow	Steamed & Detergent Washed	D65	10	85.48	-3.18	100.32	4.40	4.23
TYPE K Green	Steamed & Detergent Washed	D65	10	63.48	-37.85	64.80	9.43	7.59
TYPE K Cyan	Steamed & Detergent Washed	D65	10	50.02	-28.48	-25.32	3.30	-1.76
TYPE K Blue	Steamed & Detergent Washed	D65	10	29.29	9.38	-18.05	1.97	-0.91
TYPE K Black	Steamed & Detergent Washed	D65	10	24.88	7.77	-12.64	1.72	-1.06
TYPE K Lavender	Steamed & Detergent Washed	D65	10	27.42	21.87	-12.19	1.92	-1.27

6015374.1100499

3/61 430

CB431

				CIE				
Sample name	Time	Illum	Angle	L*	a*	b*	DE*	DR*
6869-1-2 Acid Blue 6 Nylon/Lycra	Standard	D65	10	58.0	-2.9	-34.9		
6869-1-2 Acid Blue 6 Nylon/Lycra	Steamed	D65	10	48.0	0.1	-49.9	15.9	3.8
6869-1-2 Acid Blue 6 Nylon/Lycra	Steamed&Washed	D65	10	48.3	-0.5	-49.4	15.2	3.1
6869-1-2 Acid Blue 6 Nylon/Lycra	Washed	D65	10	89.0	-4.5	-8.7	39.8	-7.2
6869-1-2 Acid Blue 6 Nylon/Lycra	Steamed Standard	D65	10	48.3	-0.1	-49.7		
6869-1-2 Acid Blue 6 Nylon/Lycra	Steamed&Washed	D65	10	48.5	-0.5	-49.4	0.5	-0.4
6869-1-2 Acid Blue 6 Nylon/Lycra	Washed	D65	10	88.8	-4.8	-9.0	57.6	-10.3
6869-1-2 Acid Blue 6 Silk Charmeuse	Standard	D65	10	56.3	-2.3	-38.4		
6869-1-2 Acid Blue 6 Silk Charmeuse	Steamed	D65	10	51.1	-4.5	-46.7	10.1	-1.5
6869-1-2 Acid Blue 6 Silk Charmeuse	Steamed&Washed	D65	10	51.2	-3.8	-47.0	10.1	-0.8
6869-1-2 Acid Blue 6 Silk Charmeuse	Washed	D65	10	82.8	-7.3	-16.1	35.0	-9.5
6869-1-2 Acid Blue 6 Silk Charmeuse	Steamed Standard	D65	10	50.9	-4.2	-46.8		
6869-1-2 Acid Blue 6 Silk Charmeuse	Steamed&Washed	D65	10	51.9	-4.1	-46.2	1.2	0.1
6869-1-2 Acid Blue 6 Silk Charmeuse	Washed	D65	10	82.8	-7.3	-15.8	44.5	-9.7

3453131 60/133

TRADUCCIÓN DEL INGLÉS AL CASTELLANO de la Solicitud de Patente de los Estados Unidos No.60/163,741 relacionada con:

RECUBRIMIENTO PARA TRATAR SUSTRATOS PARA IMPRESIÓN CON INYECCIÓN DE TINTA INCLUYENDO SOLUCIÓN DE EMBEBIDO PARA VISUALIZACIÓN Y RETENCIÓN DE IMAGEN MEJORADAS, MÉTODO PARA TRATARLOS, Y ARTÍCULOS PRODUCIDOS A PARTIR DE ELLOS

ANEXOS. La Solicitud de Patente de los Estados Unidos Serie No.60/163,741 arriba mencionada, Declaración y Poder, Solicitud de Patente, Certificación del Comisionado de Patentes y Marcas de los Estados Unidos de América; Certificación Notarial del Estado de Wisconsin, Estados Unidos de América.

LOS ESTADOS UNIDOS DE AMÉRICA

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS DE AMÉRICA

Oficina de Patentes y Marcas de los Estados Unidos

Octubre 18, 2000

ESTE PARA CERTIFICAR QUE ANEXO AL PRESENTE SE ENCUENTRA UNA FIEL COPIA TOMADA DE LOS REGISTROS DE LA OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS DE AQUELLOS DOCUMENTOS DE LA SOLICITUD DE PATENTE IDENTIFICADA ABAJO LA CUAL CUMPLE LOS REQUISITOS PARA CONCEDERLE UNA FECHA DE PRESENTACIÓN BAJO LA NORMA 35USC 111.

NUMERO DE SOLICITUD: 60/163,741
FECHA DE PRESENTACION: Noviembre 4, 1999

Por autorización del
COMISIONADO DE PATENTES Y MARCAS
T. Lawrence (Firmado)
T. LAWRENCE
Funcionario de Certificaciones

SELLO ADHERIDO

Caso # 15260
COLOMBIA

CERTIFICACIÓN

ESTADO DE WISCONSIN)
) SS
CONDADO DE WINNEBAGO)

Certifico por este medio que el documento anexo constituye una copia idéntica del original de la Solicitud de Patente de los Estados Unidos Serie No. **60/163,741** para **RECUBRIMIENTO PARA TRATAR SUSTRATOS PARA IMPRESIÓN CON INYECCIÓN DE TINTA INCLUYENDO SOLUCIÓN DE EMBEBIDO PARA VISUALIZACIÓN Y RETENCIÓN DE IMAGEN MEJORADAS, MÉTODO PARA TRATARLOS, Y ARTÍCULOS PRODUCIDOS A PARTIR DE ELLOS**, presentada en **Noviembre 4, 1999**, cedida a Kimberly-Clark Worldwide, Inc. y adicionalmente certifico que Kimberly-Clark Worldwide, Inc. es una corporación organizada y existente bajo las leyes del Estado de Delaware, Estados Unidos de América.

Fechada este 8 día de Enero, 2001, en Neenah, Wisconsin, Estados Unidos de América.

Melissa A. Blob (firmado)

Melissa A. Blob, Notario Público
Mi Comisión Expira: Agosto 1, 2004

(Sin Legalización)

RECUBRIMIENTO PARA TRATAR SUSTRATOS PARA IMPRESIÓN CON INYECCIÓN DE TINTA INCLUYENDO SOLUCIÓN DE EMBEBIDO PARA VISUALIZACIÓN Y RETENCIÓN DE IMAGEN MEJORADAS, MÉTODO PARA TRATAR DICHOS SUSTRATOS, Y ARTÍCULOS PRODUCIDOS A PARTIR DE ELLOS

Campo de la Invención

La presente invención se relaciona con recubrimientos para tratar sustratos imprimibles con inyección de tinta destinados a recibir imágenes cuando se imprimen con dispositivos de impresión de

433
3/05
GD225

inyección de tinta. En particular, la presente invención se refiere a recubrimientos para tratar sustratos textiles para impresión de inyección de tinta, métodos para tratar dichos sustratos y artículos producidos a partir de ellos. Dichos métodos facilitan el empleo de aquellos sustratos en dispositivos de impresión láser o de inyección de tinta disponibles usualmente, tales como impresoras láser y de inyección de tinta en formato ancho o angosto.

Antecedentes de la Invención

La impresión de inyección de tinta es un método de impresión sin impacto y sin contacto en el cual una señal electrónica controla y dirige gotitas o una corriente de tinta que pueden depositarse sobre una amplia variedad de sustratos. La impresión de inyección de tinta es sumamente versátil en términos de la variedad de sustratos que pueden tratarse, así como de la calidad de impresión y la velocidad de operación que pueden obtenerse. Además, la impresión de inyección de tinta es controlable digitalmente. Por estas razones, la metodología de inyección de tinta ha sido ampliamente adoptada para marcación y etiquetado industrial. Adicionalmente, la metodología de inyección de tinta ha encontrado también un empleo generalizado en aplicaciones de diseño arquitectónico y de ingeniería, creación de imágenes médicas, trabajos de impresión en oficinas (tanto de texto como de gráficos), sistemas de formación de imágenes geográficas (por ejemplo, análisis y mapeo de datos sísmicos), rotulación, en gráficos de despliegue visual (por ejemplo, reproducción fotográfica, gráficas para salas de junta y las cortes, artes gráficas) y similares. Finalmente, la impresión de inyección de tinta se ha utilizado actualmente para crear una imagen sobre una variedad de sustratos textiles. El uso de la impresión de inyección de tinta para crear una imagen sobre telas textiles ha permitido la rápida visualización de un diseño estético sobre tela sin la utilización de técnicas de impresión de pantalla costosas y a menudo con gran incidencia de desechos. Dicha metodología de impresión de inyección de tinta le permite a un diseñador o planta de producción visualizar un diseño terminado en menos tiempo significativamente del usualmente necesario para quemar una imagen de pantalla del diseño por la metodología típica de impresión de pantalla.

Los tintes y pigmentos se han usado como colorantes para dichas formulaciones de tinta de inyección de tinta. No obstante, dichos materiales no siempre se adhieren bien a los sustratos a los cuales se aplica la tinta. Por ejemplo, los tintes pueden disolverse al contacto de un sustrato con el agua. De este modo las imágenes aplicadas, que emplean metodología de inyección de tinta, pueden tender a correrse o manchar al contacto repetido, o pueden removerse realmente de la superficie impresa si se exponen a cantidades sustanciales de medios

acuosos (por ejemplo, si se lava un artículo impreso con inyección de tinta). Más aún, las imágenes aplicadas empleando metodología de inyección de tinta pueden tender también a desvanecerse o desteñirse mediante la exposición prolongada a luz visible, ultravioleta y/o infrarroja. Aún más, los tintes aplicados a sustratos textiles pueden experimentar un flujo capilar serio del tinte en la aplicación al sustrato. Finalmente, la intensidad del color de la imagen impresa sobre un sustrato textil empleando metodología de inyección de tinta carece a menudo de vigor.

La naturaleza de los sustratos textiles plantea además problemas específicos cuando se imprimen o crean imágenes por medio de métodos de impresión de inyección de tinta, que no se encuentran con sustratos comunes de inyección de tinta (por ejemplo, papel o papel recubierto). Por ejemplo, las fibras textiles pueden variar ampliamente en composición, presentado cada composición un conjunto único de condiciones para una impresión aceptable del sustrato. Por ejemplo, los sustratos de algodón pueden ser muy absorbentes, como en el caso de tintas a base de agua. Cuando la tinta es expulsada del canal de tinta de un dispositivo de impresión de inyección de tinta, ésta se absorbe rápidamente en las fibras del sustrato de algodón. Puesto que estas fibras son mucho más grandes que las fibras típicamente encontradas en sustratos de papel, la densidad del color o apariencia o brillantez del color se disminuye significativamente debido a la falta de retención del colorante en la superficie de las fibras. Adicionalmente, flujo capilar, moteado del patrón de impresión y pérdida de nitidez de la imagen claridad pueden resultar con frecuencia de la impresión sobre la tela textil misma.

Inversamente, fibras sintéticas como poliéster pueden humedecerse insuficientemente por las tintas acuosas y dichas tintas pueden retenerse solamente en los espacios intersticiales entre las fibras. Esta limitada retención de tinta ocasiona también problemas relacionados con la calidad de impresión esbozados arriba.

Aún más, la permanencia de la imagen impresa sobre telas textiles se logra a menudo comercialmente mediante cierto proceso de curado después de la impresión como calentamiento, vaporeo o fijación química. Estos procesos tienden a ser ineficientes, requiriendo pasos adicionales de lavado y secado para remover de la tela el colorante no fijado. En consecuencia, es deseable mejorar la permanencia de la imagen impresa sobre sustratos impresos de inyección de tinta, en presencia o en ausencia de un paso de curado después de la impresión.

En el comercio se emplean típicamente materiales poliméricos para modificar las propiedades de fibras textiles, naturales y sintéticas, y sustratos. Estos tratamientos poliméricos pueden alterar la apariencia textil o mano, reducir el encogimiento, reducir la flamabilidad, o alterar otras propiedades de la fibra o sustrato. Incluso pueden emplearse tratamientos para aumentar la facilidad de impresión y/o rendimiento de la impresión cuando se emplean procesos de impresión comercial, tales como impresión de pantalla rotativa. Por ejemplo, se ha usado óxido de polietileno para pretratar un material inicial de tela con el fin de crear un sustrato textil adecuado para impresión de inyección de tinta. Como se revela en la Patente US No. 5,781,216 a Haruta y otros, el uso de sustratos textiles tratados con óxido de polietileno se describe como altamente capaz de proporcionar imágenes de gran profundidad de color con suficiente brillantez y nitidez, pero libres de un flujo capilar objetable del color. Aunque Haruta revela dicho pretratamiento con óxido de polietileno con un agente cationizante para aumentar así la capacidad de coloración de las imágenes, Haruta exige que dicho tratamiento se cure posteriormente mediante pasos adicionales de calentamiento, lavado y secado.

El empleo de polímeros catiónicos como parte de un saturante de látex en una estructura fibrosa hidroenredada se revela en PCT US 98 12712 a Harris y otros, la cual se publicó como WO99/00541. Como se describe en WO99/00541, la saturación de látex requiere típicamente un paso posterior de secado u otras ayudas de curado.

También se conoce el uso de soluciones de embebido con bicarbonato de sodio, carbonato de sodio y urea. Dichas soluciones de embebido se utilizan típicamente por fábricas textiles en pastas de tinta junto con otros aditivos tales como espesantes y no en conjunción con tratamientos de recubrimiento sobre los sustratos textiles mismos antes de imprimirse. Las pastas de tinta se imprimen entonces con pantalla rotativa sobre los sustratos de tela. Sin embargo, un sistema dispensador de pasta de inyección de tinta no puede usarse para impresión de inyección de tinta debido a las limitaciones físicas de la tecnología de impresora de inyección de tinta. Las sales en las pastas corroerán las cabezas de la impresora de inyección de tinta. Por lo tanto, el uso de pasta de tinta es un proceso antieconómico. Más aún, incluso con el empleo de dichas pastas en un proceso convencional de impresión de pantalla, el proceso experimenta una gran cantidad de desteñido del tinte después de la impresión.

Por consiguiente, en el arte subsiste todavía una necesidad de recubrimientos de sustrato imprimible con inyección de tinta y métodos de tratamiento que proporcionen alta densidad óptica con una cantidad

mínima de flujo capilar sobre el sustrato durante y después de la creación de imágenes de impresoras de inyección de tinta. Subsiste también en el arte una de métodos de tratamiento de un sustrato imprimible con inyección de tinta, los cuales puedan aplicarse a sustratos de tela textil. En este aspecto, existe aún en el arte una necesidad de métodos para tratar telas para recibir formulaciones de tinta con inyección de tinta, métodos que permiten una mejor resistencia del color e intensidad del color en una amplia variedad de sustratos textiles. Por último, existe aún en el arte una necesidad de sustratos que no dependan de un paso de curado de la tinta para su fabricación.

Resumen de la Invención

De acuerdo con la presente invención, se ha descubierto que la densidad y calidad del color de la imagen impresa y las propiedades de adhesión y/o resistencia del color de formulaciones de tinta de inyección de tinta a base de tinte ácido y reactivo, cuando se aplican a una variedad de sustratos imprimibles con inyección de tinta, pueden mejorarse tratando los sustratos con formulaciones de recubrimiento usadas en conjunción con soluciones de embebido. En particular, una amplia gama de sustratos de tela textil puede tratarse para mejorar la resistencia del color y la resistencia al lavado de las formulaciones de tinta de inyección de tinta. Las formulaciones de tratamiento incluyen una formulación de recubrimiento acuoso que contiene sólidos y que comprende un polímero catiónico o copolímero, un suavizante textil, urea y bicarbonato de sodio, carbonato de sodio, o una combinación de los mismos, para tintas a base de tinte reactivo, o como alternativa, los mismos polímeros catiónicos y suavizantes de tela, pero adicionalmente urea y sulfato de amonio para tintas a base de tinte ácido. En particular, las formulaciones de tratamiento incluyen alrededor de 5 a 95% de polímeros catiónicos o copolímeros, y alrededor de 5 a 20% de suavizantes de tela. Alternativamente, las formulaciones pueden contener también alrededor de 0–80% de un aglutinante de látex polimérico con el fin de incrementar la resistencia al lavado. Estos porcentajes se basan en sólidos. El contenido total de sólidos para las formulaciones varían típicamente desde alrededor de 10 a 50%. En una modalidad alternativa, puede hacerse uso de recubrimientos de polímeros catiónicos en conjunción con una solución separada de embebido de bicarbonato de sodio o carbonato de sodio y urea para clases de tinte reactivo. En una modalidad alternativa, pueden utilizarse formulaciones de recubrimiento de polímero catiónico en conjunción con una solución separada de embebido de sulfato de amonio y urea para clases de tinte ácido. Los presentes métodos proveen vías para la fijación de tintes, sin importar la clase química o el sustrato de tela textil, y lo hacen así sin necesidad de ningún proceso adicional de curado de la tinta más allá del secado bajo

condiciones ambiente. Adicionalmente, la eficacia de los procesos después de la impresión, como vaporeo o curado, puede mejorarse por medio de dichas formulaciones, reduciendo el desperdicio de tinte e intensificando además el vigor del color. Del mismo modo, mediante estas formulaciones puede mejorarse la fijación del pigmento o colorante.

Éstas y otras características y ventajas de la presente invención se harán evidentes luego de una revisión de la siguiente descripción detallada de las modalidades reveladas y las reivindicaciones anexas.

Breve Descripción de los Dibujos

Las Figuras 1A a 1C ilustran polímeros catiónicos ejemplares para uso en formulaciones de tratamiento para sustratos de acuerdo con los presentes métodos inventivos.

La Figura 2 ilustra una vista esquemática de un proceso de inmersión y exprimido para tratar sustratos imprimibles con inyección de tinta.

Descripción Detallada de la Invención

De acuerdo con la presente invención, se proporcionan recubrimientos acuosos y métodos para mejorar las propiedades de adhesión y/o resistencia del color/densidad del color y resistencia al lavado de sustratos imprimibles con inyección de tinta en la ausencia de un paso de calentamiento o curado de tratamiento posterior, incluyendo dichos métodos tratar un sustrato textil con una formulación de recubrimiento acuoso que comprende polímeros catiónicos o copolímeros y suavizantes de tela. En un método deseable, el método comprende tratar un sustrato textil con una formulación de recubrimiento acuoso que incluye 5–95% de polímeros catiónicos o copolímeros, y alrededor de 5–20% de suavizantes de tela. Tal como se expuso anteriormente, estos porcentajes son por ciento de sólidos totales, a menos que se indique lo contrario. Para los propósitos de esta solicitud, el porcentaje de los sólidos totales se calcula dividiendo el valor de las partes secas para un componente particular por las partes secas totales de todos los componentes de la formulación. La presente invención se dirige además a un sustrato tratado imprimible con inyección de tinta donde el tratamiento comprende una formulación de recubrimiento acuoso de polímeros catiónicos o copolímeros y suavizantes de tela. Una modalidad deseable de la presente invención es un sustrato tratado imprimible con inyección de tinta donde el tratamiento de recubrimiento acuoso comprende alrededor de 5 a 95% de polímeros catiónicos o copolímeros, y alrededor de 5 a 20% de suavizantes de tela.

Los copolímeros catiónicos funcionan en la formulación para atraer y fijar moléculas de tinte aniónico de carga opuesta a los sustratos y, en particular, sustratos de tela textil. Los polímeros o copolímeros pueden contener residuos reactivos o grupos capaces de enlazarse cruzadamente a las fibras textiles, con ellos mismos, o con otros componentes presentes en la formulación. Dichas resinas catiónicas pueden incorporar grupos de carga en las cadenas principales de polímero o estructuras de polímero, o como grupos laterales en las cadenas de polímero. Un listado ejemplar de las fórmulas estructurales de dichos polímeros catiónicos se ilustra en las Figuras 1A a 1C. Los polímeros catiónicos para uso en los recubrimientos pueden incluir, pero no se limitan a, polímeros y copolímeros de monómeros de dialildialquil amonio como monómeros de cloruro de dialildimetilamonio, acrilato catiónico y acrilamida como cloruro de acriloxietildimetilamonio o cloruro de acrilaminoetildimetilamonio, vinilpiridina cuaternizada como cloruro de vinilpiridina, y polímeros de polialquilamina y copolímeros. Co-monómeros en dichos sistemas pueden estar conformados por aquellos que modifican la flexibilidad, hidrofobicidad, o propiedades mecánicas de la molécula de polímero. Adicionalmente, pueden incluirse monómeros reactivos y/o auto-condensantes para aumentar la adhesión a la fibra textil u otros componentes en la formulación. Otros ejemplos de polímeros catiónicos con grupos cargados en la cadena principal incluyen polímeros de epihalohidrin-amina como los polímeros Reten™ 204 LS y Kymene™ 557 LX de Hercules Incorporated, de Wilmington, Delaware. Un ejemplo específico de una resina de polímero catiónico preferido es CP 7091 RV disponible de ECC International de Roswell, Georgia, siendo CP 7091 RV un cloruro de poli(dialildimetilamonio-co-diacetona acrilamida).

Suavizantes de tela apropiados que pueden usarse de acuerdo con los presentes recubrimientos/métodos inventivos incluyen, pero no se limitan a, Varisoft 222 de la Witco Corporation de Greenwich, Connecticut, Adogen 432 también de la Witco Corporation, Accosoft 550-75 de la Stepan Company de Northfield, Illinois, Alubrasoft Super 100 y Alubrasoft 116 de la BASF Corporation, Specialty Chemicals Division de Mt. Olive, New Jersey, y Ahcovel Base N-62 de ICI Surfactants o Hodgson Textiles Chemical de Mt. Holly, Carolina del Norte. Suavizantes de tela apropiados incluyen aquellos que son catiónicos o no iónicos y proporcionan los atributos de calidad de impresión y brillantez de imagen al sustrato textil impreso. El suavizante de tela más adecuado para un sustrato de tela textil particular varía según el sustrato de tela. Por ejemplo, se ha descubierto que el suavizante de tela Varisoft 222 se comporta mejor con muestras de tela/pendón de algodón mientras que el Adogen 432 se comporta mejor con muestra de nylon/lycra.

En otra modalidad de la presente invención, los tratamientos de recubrimiento previamente descritos o formulaciones para sustratos imprimibles con inyección de tinta incluyen también un aglutinante de látex con el fin de incrementar aún más la adhesión y/o resistencia al lavado de colorantes sobre los sustratos de tela textil. Se ha encontrado que los sustratos recubiertos receptivos de inyección de tinta que incluyen un aglutinante de tinta proporcionan una mejor densidad y saturación del color, superior calidad de impresión, reducción del empabilamiento o flujo capilar y absorción mejorada de la tinta. Más aún, las formulaciones de recubrimiento o tratamiento proporcionan una imagen impresa resistente al agua cuando se imprime por medio de un proceso de impresión de inyección de tinta, sin la necesidad de pasos de curado después de la impresión como calentamiento, vaporeo, fijación química, o radiación. De igual modo, la presente invención se dirige también a un sustrato tratado imprimible con inyección de tinta donde el tratamiento comprende una formulación de recubrimiento acuoso de polímeros catiónicos o copolímeros, suavizantes de tela y un aglutinante de látex. Una modalidad deseable de la presente invención es un sustrato tratado imprimible con inyección de tinta donde la formulación de recubrimiento acuoso comprende alrededor de 5 a 95% de polímeros catiónicos o copolímeros, alrededor de 5 a 20% de suavizantes de tela y alrededor de 0 a 80% de un aglutinante de látex.

Las formulaciones de tratamiento o recubrimiento en esta modalidad alternativa está conformado principalmente por polímeros catiónicos y copolímeros, suavizantes de tela y un polímero insoluble en agua en la forma de una dispersión de látex o emulsión. En particular, la formulación de tratamiento puede incluir alrededor de 0–80% de un aglutinante de látex polimérico dependiendo del sustrato de tela textil. Los polímeros reforzadores de látex pueden ser no iónicos o catiónicos. A modo de ejemplo únicamente, los materiales de látex pueden incluir vinilacetato, etilen-vinilacetato, acrilato, estireno y resinas de estireno-acrilato y otros látexes catiónicos o no iónicos. Estas resinas pueden incluir grupos reactivos o de auto-enlazamiento cruzado, además de funcionalidad catiónica inherente.

Las formulaciones de recubrimiento acuoso pueden incluir también otros aditivos que afecten la apariencia o propiedades táctiles del sustrato terminado, como brillantez óptica. Debe reconocerse que todos los porcentajes expuestos se basan en sólidos, a menos que se anote lo contrario. El contenido de sólidos totales para las formulaciones varía típicamente desde alrededor de 5 a 50%, pero deseablemente varía desde alrededor de 5 a 32%. Más deseablemente, el contenido de sólidos totales para las formulaciones varía desde alrededor de 25 a 28%.

Las formulaciones de tratamiento (composiciones) para los sustratos textiles se elaboran agregando los componentes ya mencionados de soluciones patrón o dispersiones, o como sólidos, donde se estime apropiado, y mezclando hasta obtener homogeneidad. La aplicación de la formulación de tratamiento a los sustratos textiles puede llevarse a cabo por cualquiera de los medios conocidos por aquellas personas que tienen una habilidad ordinaria en el arte. Por ejemplo, los sustratos de tela pueden tratarse con un método estándar de engomado (inmersión y exprimido) y secarse en un horno de aire forzado, aunque puede emplearse cualquier método adecuado de secado de textiles conocido por aquellas personas con habilidades en el arte. Como puede apreciarse en FIG. 2, que muestra una vista esquemática de un proceso de inmersión y exprimido 10 para tratar sustratos imprimibles con inyección de tinta, un sustrato textil 20 se desenrolla del rollo entrante 30 y se sumerge luego en un tanque/baño saturador 40 durante un tiempo suficiente para que se sature con la formulación de tratamiento. El sustrato textil se corre entonces a través de un juego de rodillos presurizados con línea de contacto 44 y 48. La presión sobre los rodillos debe estar en el rango de alrededor de 10-120 psig, pero deseablemente en el rango de alrededor de 10-65 psig, dependiendo del tipo de sustrato de tela textil utilizado y el contenido de sólidos totales de las formulaciones de tratamiento empleadas. Los rodillos presurizados con línea de contacto exprimen el recubrimiento uniformemente sobre el sustrato de manera que penetre la superficie del sustrato. Los rodillos pueden ser de caucho o acero, sin embargo es deseable un juego de rodillos en el cual por lo menos un rodillo sea de caucho. A continuación del paso por los rodillos de presión con línea de contacto, el sustrato textil se dirige a través de un medio de secado 50. El medio de secado puede incluir un marco tensor para sostener el sustrato textil, y él mismo puede incluir múltiples medios consecutivos de secado dependiendo de la naturaleza del sustrato a secar. La temperatura de secado está preferiblemente en el rango de desde alrededor de 200°F a 325°F, deseablemente ente alrededor de 220 a 250°F. El tiempo típico de secado se encuentra entre alrededor de 30 segundos y 3 minutos. A continuación del secado, el sustrato textil tratado y terminado se toma en un rodillo de enrollamiento 52. El sustrato textil puede enrollarse para almacenamiento o llevarse a un segundo proceso de laminación en preparación para la impresión con inyección de tinta. El sustrato textil puede laminarse en un respaldo de soporte para facilidad de impresión.

Empleando este método de aplicación, los índices de levantamiento del sustrato textil pueden variar desde alrededor de 0.5% a alrededor de 50%. Deseablemente, los índices de levantamiento seco pueden variar desde alrededor de 3 a alrededor de 20%. Más deseablemente, los índices de levantamiento seco pueden variar desde

alrededor del 6 a alrededor de 15%. Los índices de levantamiento húmedo para los sustratos textiles se encuentran típicamente entre alrededor de 30-150%. Deseablemente dichos índices de levantamiento húmedo están entre alrededor de 80-120%. Deseablemente para pendones de dacrón, los índices de levantamiento húmedo se sitúan entre alrededor de 40-120%. Estos términos se definen por las ecuaciones que siguen.

Los sustratos que pueden tratarse de acuerdo con los presentes métodos inventivos son variados e incluyen papel, tela, películas y similares, aunque se prefieren sustratos de tela textil. Dichos sustratos pueden incluir algodón, seda, lana, poliéster, rayón, nylon y sus mezclas. Más aún, los sustratos revelados de inyección de tinta pueden proporcionar las ventajas reveladas aquí con o sin pasos adicionales de curado después de la impresión que incluyan el uso de calor, radiación o presión. Idealmente dichos sustratos tratados proporcionan adhesión y/o resistencia del color del colorante con tan sólo un curado a temperatura ambiente o temperatura del recinto y secado de la imagen impresa. Debe notarse sin embargo que, aunque no siendo necesario para el proceso, un paso de curado después de la impresión puede mejorar aún más la resistencia del color y la resistencia al lavado de la imagen impresa sobre el sustrato. El peso base de las diferentes telas que pueden tratarse por estas formulaciones puede variar desde alrededor de 2 onzas por yarda cuadrada (osy) a alrededor de 9 osy.

Clases de tintes que pueden emplearse en impresoras de inyección de tinta a imprimirse sobre dichos sustratos incluyen tintes ácidos, tintes reactivos, tintes directos, tintes azoicos, tintes de azufre, tintes modificados, tintes poliméricos, tintes copolimerizados u otras clases de colorantes conocidos por aquellas personas con habilidades en el arte. Más aún, pueden emplearse colorantes de pigmento en las impresoras de inyección de tinta a imprimirse en dichos sustratos. Adicionalmente, se ha encontrado que cuando dicho sustrato se imprime con tintas de inyección de tinta que contienen aditivos, tales como los descritos en la Solicitud Número de Serie 09/109,681, presentada el 2 de julio de 1998 y la Patente US No. 5,897,694 incorporadas aquí por referencia en su totalidad, dichos tratamientos del sustrato pueden intensificarse con el fin de mejorar la resistencia del color y la resistencia al lavado.

En una modalidad más de la presente invención, dichas formulaciones de tratamiento previamente descritas pueden emplearse en un método para tratar sustratos de tela textil de pendón. Dichos materiales de sustrato incluyen 100% algodón, 100% poliéster, 100% seda, nylon, rayón y materiales mezclados, como mezclas de algodón y poliéster, al igual que materiales no tejidos. Por ejemplo, se ha

descubierto que el tratamiento previo de sustrato de tela textil de pendón con una formulación de recubrimiento acuoso que incluya polímeros catiónicos, suavizantes de tela y aglutinantes de polímero de látex de acuerdo con los métodos previamente descritos habilitan a los sustratos de pendón para que sean imprimibles con inyección de tinta, con una resistencia mejorada al cambio del color/densidad del color y resistencia al lavado, y con flujo capilar reducido del color. Igualmente, la presente invención se dirige también a un sustrato de pendón imprimible con inyección de tinta donde el tratamiento comprende una formulación de polímeros catiónicos o copolímeros, suavizantes de tela y un aglutinante opcional de látex. Una modalidad deseable de la presente invención es un sustrato de pendón imprimible con inyección de tinta donde la formulación de tratamiento acuoso incluye entre alrededor de 5-95% de polímeros catiónicos o copolímeros, entre alrededor de 5-20% de suavizantes de tela y entre alrededor de 0-80% de aglutinante de látex.

De acuerdo con aún una modalidad más de la presente invención, se proporcionan artículos producidos por los métodos ya descritos, empleando sustratos de textil tratados como se describe aquí. Dichos artículos pueden incluir por ejemplo pendones, papel de colgadura y otros productos de amoblado del hogar. Así, de acuerdo con la presente invención, imágenes impresas con inyección de tinta aplicadas a un sustrato tratado como se describe aquí, resisten la remoción de dicha imagen de dicho sustrato, incluso en contacto repetido con agua del sustrato impreso. Dicho contacto repetido puede ser el resultado del manejo normal de un artículo, exposición accidental a líquido y lavado de rutina del artículo. Cuando los artículos de acuerdo con la presente invención comprenden un sustrato que incluye una imagen con inyección de tinta impresa sobre ellos, la imagen resultante se adhiere suficientemente a dicho sustrato para resistir la remoción de allí al lavar dicho artículo. La presente invención, incluyendo cada una de las diferentes modalidades, se describe con más detalle con los ejemplos que siguen. No obstante, dichos ejemplos no tienen que interpretarse com limitantes en ningún modo el espíritu ni la órbita de la presente invención.

Ejemplos Preliminares

Muestras de sustrato textil se imprimieron primero con un patrón de ensayo utilizando una impresora comercial de inyección de tinta que empleaba tintas de inyección de tinta que contenía tintes ácidos, reactivos y/o directos. Se evaluaron la densidad del color, el flujo capilar del color y la calidad de impresión en las muestras una vez impresas. Estos textiles incluían sustratos textiles de popelina de algodón. Duplicados de ambos juegos de muestras se lavaron usando un método de lavado como el que

se describe. Se evaluaron la densidad del color, flujo capilar del color, calidad de impresión o apariencia y permanencia del color utilizando las muestras lavadas. Los datos de los ejemplos preliminares se expresan en la siguiente Tabla 1.

TABLA 1

TINTA	ADITIVO DE TINTA	TRATAMIENTO DE LA TELA	TRATAMIENTO CON CALOR	RESISTENCIA DEL COLOR EVALUACIÓN CON AGUA DELTA E	DETERGENTE DELTA E
Encad GA	Ninguno	Ninguno	Ninguno	<56	<82
Encad GA	Ninguno	0.5% CP 7091 RV	Ninguno	<29	<66
Encad GA	Ninguno	1.0% CP 7091 RV	Ninguno	<28	<50
Encad GA	Ninguno	2.0% CP 7091 RV	Ninguno	<27	<32

CP 7091 RV es un copolímero de cloruro de dialildimetil amonio/acilamida de diacetona, ECC International. Tintas Encad GA emplean tintes monoméricos estándar. Las muestras se lavaron manualmente. El muestreo analizó tintas magenta. Delta E se calculó en las muestras empleando el espectrodensitómetro y la ecuación descritos más adelante. El muestreo se realizó utilizando un método de inmersión y exprimido, como se describió anteriormente. Como puede verse, el recubrimiento en los Ejemplos Preliminares sólo incluía polímero catiónico en la formulación acuosa. El porcentaje representa solución porcentual.

Un segundo juego de ensayos más rigurosos se llevó a cabo en una variedad de sustratos de tela. Estos sustratos de tela textil incluyen los materiales enumerados en la Tabla 2.

TABLA 2

TELA	ESTILO	Construcción	FUENTE	PESO BASE (OZ/YD^2)	PESO BASE UNIDADES SI (G/M^2)
Popelina de Poliéster –	RP 6248	Tejido Plano	Fisher Textiles	3.8	128.8
Satín de Poliéster –	PS 241	Satín	"	4.1	139.0
Dacrón Poliéster 250 Denier	Dacrón 250	Tejido Plano	"	3.2	108.5

— Popelina de Algodón	9680	"	Lorber Industries	6.5	220.39
— Jersey de Algodón	5118	Tejido de Punto	"	8.2	277.9
— Sábana de Algodón		Tejido Plano	Cranston Mills	7.0	237.2
— Charmeuse de Seda .16 mm	12104	Satín	U.S. Silk, Inc.	2.0	67.8
— Crepe de Chine de Seda .18 mm	14654	Crepé	"	2.3	78.0
— Georgette de Poliéster	NOFU7-6058"	Georgette Crepé	Scher Fabrics, Inc.	3.8	128.8
— Crepé Estirado de Poliéster		Tejido de Punto	"	3.2	108.5
— Mezcla Poliéster/ Lycra	55153	Tejido de Punto	Guilford Mills	5.5	186.4
— Mezcla Nylon/Lycra	56062	Tejido de Punto	"	4.0	135.6
— Rayón	YWSR 1352	Crepé	U.S. Silk, Inc.	3.5	118.6

U.S. Silk, Inc. se encuentra ubicada en Nueva York, NY. Guilford Mills se encuentra localizada en Nueva York, NY. Scher Fabrics tiene su sede en Nueva York, NY. Cranston Mills se halla en Cranston, RI. Lorber Industries se localiza en Gardena, CA. Fisher Textiles se ubica en Indian Trail, NC.

Condiciones para el Segundo Grupo de Ejemplos
Pasos de Impresión

En cada uno de los siguientes ejemplos las muestras textiles tratadas se imprimieron utilizando una impresora de inyección de tinta Encad Pro E (@ 300 dpi) de Encad Inc. de San Diego, California. Se emplearon tintas Encad GA, GS, o GO utilizando Modo de Impresión Mejorado de 4 Pasadas, es decir con la impresora pasando sobre el sustrato textil cuatro veces. En algunos casos, como se anota como doble

impacto en las tablas de datos, la cabeza de impresión se precalentó y se escogió la opción identificada como número "7" en la impresora. Esta opción permitió que se expulsara más tinta de la impresora sobre los sustratos. Los tintes en las tintas estaban conformados por tintes reactivos, ácidos y/o directos y se describen en la Tabla 3.

TABLA 3
Tintas Usadas

Tinta GS		
Color	Orden#	Tintes
Cian	209489	Directo
Magenta	208163-2	Ácido/Reactivo
Amarillo	208163-3	Ácido
Negro	208163-4	Directo
Tinta GS		
Color	Orden#	
Cian	208165-1	Pigmento
Magenta	208165-2	Pigmento
Amarillo	208165-3	Pigmento
Negro	208165-4	Pigmento
Tinta GS		
Color	Orden#	Tintes
Cian	209491	Directo
Magenta	209490	Ácido
Amarillo	208164-3	Ácido
Negro	208164-4	Directo

Los tamaños de las muestras fueron típicamente 11 por 15 pulgadas. Adicionalmente, se empleó una impresión floral de tres colores, que utilizaba lavanda, verde y magenta para hacer pruebas, de alrededor de 14 por 25 pulgadas de tamaño. Donde fue difícil distinguir entre tonalidades de verde, se evaluó también una porción neutral (es decir libre de tinta) de la muestra.

Mediciones del Color

Las mediciones de los valores de color L* a* b* (CIE 1976 Commission Internationale de l'Eclairage) y densidad óptica se realizaron en los sustratos textiles impresos empleando un Espectrodensitómetro X-Rite 938 (D65/10°) que usaba filtros CMY, de acuerdo con el manual del operador. El espectrodensitómetro X-Rite se obtuvo de la X-Rite Corporation de Grandville, Michigan. Se tomaron densidades ópticas

promedio como la sumatoria del promedio de tres mediciones empleando cada filtro. Delta E se calculó de acuerdo con la siguiente ecuación:

$$\Delta E = SQRT\ [L^*patrón - L^*muestra)^2 + (a^*patrón - a^*muestra)^2 + (b^*patrón - b^*muestra)^2]$$

A mayor Delta E, mayor es el cambio en la densidad del color. A menos que la intensidad del color se aumente mediante un paso de curado, un gran aumento en Delta E sería típicamente indicativo de desvanecimiento. Las pruebas se realizaron de acuerdo con ASTM DM 224-93 y ASTM E308-90. Donde los valores para Delta E son menores que 3.0, se acepta generalmente que dicho cambio de color no puede observarse con el ojo humano. Una descripción detallada de las pruebas con espectrodensitómetro se obtiene en Color Technology in the Textile Industry, segunda Edición, Publicada en 1997 por AATCC (American Association of Textile Chemists & Colorists).

Método de Lavado para Muestras Textiles

Cuando era indicado, las muestras textiles se lavaron empleando el siguiente método. Las muestras se depositaron en un vaso de pico de tamaño apropiado o recipiente como un vaso de pico de litro. Las muestras se pusieron luego bajo agua fría corriente (entre alrededor de 10-20°C) durante cerca de dos minutos. A continuación se extrajo el agua fría de las muestras textiles. Los vasos de pico se llenaron entonces con agua caliente (entre alrededor de 40-50°C) y se agregó una onza de detergente (Synthrapol ®) por galón de agua a los vasos de pico.

Las muestras textiles se lavaron entonces durante alrededor de cinco minutos y luego se enjuagaron y se les extrajo el agua restante. Finalmente. Las muestras textiles se enjuagaron con agua tibia (de entre alrededor de 25-30°C) durante dos minutos seguida por un enjuague con agua fría (de entre alrededor de 10-20°C) durante alrededor de un minuto más.

Típicamente, aunque no requerido necesariamente para curado, un segundo juego de muestras se imprimieron y, posteriormente, se vaporizaron empleando un evaporador de laboratorio para comparación. Para los fines de los ejemplos, si un nivel de resistencia del color se caracterizaba como deficiente, había ocurrido empabilamiento o flujo capilar. Si un nivel de resistencia del color se caracterizaba como deficiente, la imagen se destefiía. Si un nivel de resistencia de cambi del color y resistencia al lavado se había caracterizado como bueno, el vigor del color y la retención de imagen eran notoriamente mejores que el nivel deficiente. Si los niveles de resistencia del color y la resistencia al lavado se caracterizan com excelentes, las propiedades del color y vigor eran los niveles más altos con la densidad del color más alta.

Ejemplos

Debe anotarse que para cada uno de los siguientes ejemplos, el sustrato textil se había laminado en un respaldo de papel recubierto adhesivo que se había obtenido de American Builtrite Inc. bajo la designación ProtecRite ® 6798 antes de la impresión para habilitar al sustrato para que se pase fácilmente a través de la impresora. Los sustratos se retiraron luego del respaldo antes del lavado. Papeles de respaldo recubiertos adhesivos identificados por la designación 6798 incluyen un papel que tiene un espesor nominal de 5.4 ml, un valor inicial de adhesión de 27 oz/in, una resistencia a la tensión de 16 lbs/in y una capacidad de alargamiento del 10%. Las formulaciones de lote utilizadas se describen en los siguientes sumarios de ejemplos.

Ejemplo 1. Copolímero catiónico CP 7091 RV (ECC International), cloruro de poli(dialildimetilamonio-co-diacetona acrilamida), se obtuvo en una solución patrón de 49.3% en agua. 20.3 partes húmedas de esta solución (10 partes secas, o alrededor de 90-91% de las partes secas totales) se adicionaron a 70.3 partes de agua mezclando al mismo tiempo. Se agregaron 1.1 partes húmedas (1 parte seca, o alrededor de 9% de las partes secas totales) de suavizante de tela Varisoft ® 222 (90% en agua) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar popelina de algodón 100% vía la aplicación de un engomado y se secó como se describió previamente. Una porción de esta muestra se laminó en un soporte [base] de papel adhesivo, impreso con una impresora de inyección de tinta y se secó bajo condiciones ambiente. Las propiedades de la muestra se evaluaron en cuanto calidad de la imagen impresa, retención de la tinta y densidad del color o saturación bajo las siguientes condiciones: 1) inmediatamente después de la impresión, 2) después de la impresión y lavado, 3) después de la impresión y vaporeo, 4) después de la impresión, vaporeo y lavado. Las muestras impresas exhibieron calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron presentaron una intensificación excelente del color y apariencia. La resistencia al lavado de las muestras vaporeadas y de las muestra sin tratamiento posterior con vapor exhibieron retención moderada del color cuando se lavaron. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 2. La formulación empleada en Ejemplo 1 se utilizó para tratar tela georgette de poliéster 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 1. Este ejemplo empleó componente de tinta GS y componente de tinta GO.

Ejemplo 3. 20.3 partes húmedas (copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (10 partes secas o alrededor de 90-91% de las partes secas totales) se agregaron a 48.9 partes de agua mezclando al mismo tiempo. Se añadieron 22.5 partes húmedas de suavizante de tela Adogen® 432 (4.4% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerla homogénea. La formulación se utilizó para tratar popelina de algodón 100% por medio de la aplicación de un engomado convencional y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron presentaron intensificación excelente de color y apariencia. La resistencia al lavado de las muestras vaporeadas y las muestras sin tratamiento posterior con vapor exhibieron retención moderada del color cuando se lavaron. Este ejemplo utilizó componente de tinta GS.

Ejemplo 4. La formulación empleada en Ejemplo 3 se usó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 3. Este Ejemplo empleó componente de tinta GS.

Ejemplo 5. La formulación empleada en Ejemplo 3 se usó para tratar tela crepe de chine de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 3. Este Ejemplo empleó componente de tinta GS.

Ejemplo 6. 20.3 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) se agregaron a 48.9 partes de agua mezclando al mismo tiempo. Se agregaron 11.3 partes húmedas de suavizante de tela Adogen® 222 (4.4% en agua) y 11.3 partes húmedas de Varisoft® 222 (4.7% en agua) y toda la solución se mezcló hasta hacerla homogénea. Esta formulación se empleó para tratar popelina de algodón 100% por medio de una aplicación de engomado convencional y se secó. La muestra se imprimió y evaluó utilizando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron exhibieron excelente intensificación de color y apariencia. La resistencia al lavado de las muestras vaporeadas y las muestras sin tratamiento posterior con vapor presentaron retención moderada del color al lavarlas. Este Ejempl utilizó componente de tinta GS.

Ejemplo 7. Una composición de tratamiento se formuló como en el Ejemplo 6, sustituyendo 23.1 partes húmedas de suavizante de tela

Accosoft® 550 (4.3% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) por partes de suavizante de tela Adogen® 432. El polímero catiónico constituía 10 partes secas o alrededor de 90-91% de las partes secas totales. Las partes húmedas de agua constituían alrededor de 48.2 partes. Esta formulación se empleó para tratar popelina de algodón 100% por medio de aplicación de engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejempl 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron exhibieron excelente intensificación de color y apariencia. La permanencia del color al lavado de las muestras vaporeadas se incrementó dramáticamente comparada con las muestras no tratadas. Se logró cierta mejora de la resistencia del color sin vaporeo. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 8. La formulación empleada en Ejemplo 7 se utilizó para tratar tela mezclada 85/15 nylon/lycra. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 7. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 9. La formulación empleada en Ejemplo 7 se utilizó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 7. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 10. Una composición de tratamiento se formuló como en el Ejemplo 3, sustituyendo 22.7 partes húmedas de suavizante de tela Alubrasoft® Super 100 (4.4% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) por partes de suavizante de tela Adogen® 432. La formulación incluía 20.3 partes húmedas de 7091 RV (10 partes secas, o alrededor de 90-91% de las partes secas totales) y 48.7 partes de agua. Esta formulación se empleó para tratar popelina de algodón por medio de una aplicación de engomado convencional y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron exhibieron excelente intensificación de color y apariencia. La permanencia del color al lavado de las muestras vaporeadas se incrementó dramáticamente comparada con las muestras no tratadas. Se logró cierta intensificación de la resistencia del color sin vaporeo. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 11. La formulación empleada en Ejemplo 10 se utilizó para tratar tela mezclada 85/15 nylon/lycra. Los resultados para esta tela

fueron similares a los obtenidos en Ejemplo 10. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 12. La formulación empleada en Ejemplo 10 se utilizó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 10. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 13. Una composición de tratamiento se formuló como en el Ejemplo 3, sustituyendo 8.8 partes húmedas de suavizante de tela Ahcovel® (11.3% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) por partes de suavizante de tela Adogen® 432. La formulación incluía 20.3 partes húmedas de 7091 RV (10 partes secas, o alrededor de 90-91% de las partes secas totales) y 62.5 partes de agua. Esta formulación se empleó para tratar popelina de algodón 100% por medio de una aplicación de engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que se vaporizaron exhibieron excelente intensificación de color y apariencia. La permanencia del color al lavado de las muestras vaporeadas se incrementó dramáticamente comparada con las muestras no tratadas. Se logró buena intensificación de la resistencia del color sin vaporeo. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 14. Copolímero catiónico CP 261 LV (ECC International), poli(dialildimetilamonio), se obtuvo en una solución patrón de 43.0% en agua. Se adicionaron 23.3 partes húmedas de esta solución (10 partes secas, o alrededor de 90-91% de las partes secas totales) a 47.1 partes de agua mezclando al mismo tiempo. Se agregaron 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron retención moderada del color cuando se lavaron. Se logró cierta intensificación de la resistencia del color. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La resistencia al lavado de las muestras vaporeadas y de las muestras sin tratamiento posterior con vapor exhibieron retención moderada del color cuando se lavaron. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 15. 28.8 partes húmedas de una solución que contenía 80% de polietilenimina etoxilada (34.7% en agua) (10 partes secas, o alrededor de 90-91% de las partes secas totales) se combinaron con 41.6 partes de agua mezclando al mismo tiempo. Se agregaron 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron retención moderada del color cuando se lavaron. Se logró cierta intensificación de la resistencia del color. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La resistencia al lavado de las muestras vaporeadas y de las muestras sin tratamiento posterior con vapor exhibieron retención moderada del color cuando se lavaron. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 16. 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 18-19% de las partes secas totales) se adicionaron a 656 partes de agua mezclando al mismo tiempo. Se agregaron 90.6 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etileno-vinilacetato, 55.2% en agua) (50 partes secas, o alrededor de 37% de las partes secas totales) de AirProducts and Chemicals Inc. de Allentown, Pensilvania, 114.9 partes húmedas de emulsión acrílica PrintRite® 595 (BF Goodrich, 43.5% en agua) (50 partes secas, o alrededor de 37% de las partes secas totales) y 212.8 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (10 partes secas, o alrededor de 7% de las partes secas totales) se agregaron y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron retención buena del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 17. La formulación empleada en Ejemplo 16 se utilizó para tratar tela de punto jersey de algodón 100%. Los resultados para esta tela

fueron similares a los obtenidos en Ejemplo 16. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 18. La formulación empleada en Ejemplo 16 se utilizó para tratar tela mezclada 85/15 nylon/lycra. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 16. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 19. La formulación empleada en Ejemplo 16 se utilizó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 16. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 20. La formulación empleada en Ejemplo 16 se usó para tratar tela crepe de chine de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 16. Este Ejemplo empleó componente de tinta GS.

Ejemplo 21. 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 18-19% de las partes secas totales) se adicionaron a 656.0 partes de agua mezclando al mismo tiempo. Se agregaron 90.6 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etileno-vinilacetato, 55.2% en agua) (50 partes secas, o alrededor de 37% de las partes secas totales), 114.9 partes húmedas de emulsión acrílica PrintRite® 591 (BF Goodrich, 43.5% en agua) (50 partes secas, o alrededor de 37% de las partes secas totales) y se agregaron 212.8 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (10 partes secas, o alrededor de 7% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. Esta formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 22. La formulación empleada en Ejemplo 21 se utilizó para tratar tela de punto jersey de algodón 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 21. Este Ejemplo utilizó componente de tinta GS.

Un resultado de la muestra para valores Delta E se refleja en la siguiente Tabla 4. Debe reconocerse que los valores para Delta E pueden variar de 0 a 100 prefiriéndose los valores más bajos para demostrar pérdida mínima de vigor del color/desvanecimiento. Los valores Delta E son una comparación de muestras "tratadas y lavadas" o "tratadas y lavadas en seco" versus muestras "tratadas". En algunos casos, los valores Delta E son una comparación de muestras "tratadas, vaporeadas y lavadas" versus muestras "tratadas". Las telas textiles que fueron capaces de imprimirse sin un recubrimiento experimentaron atributos de impresión deficientes y desteñido total (con un Delta E teóricamente en cerca de 100). Los siguientes datos se aplican a una muestra de Cranston Cotton, la cual se trató con una formulación de recubrimiento como se describe en Ejemplo 21.

Tabla 4

TRATADA	L*	A*	B*	DELTA E
Magenta	58.0	30.8	-17.6	Estándar
Tratada & Lavada				
Magenta	59.0	37.2	-22.9	8.3

Ejemplo 23. La formulación empleada en Ejemplo 21 se utilizó para tratar tela charmeuse de seda 100%. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 21. Este sustrato se limpió utilizando equipos comerciales de limpieza en seco y los resultados de la mezcla se reflejan en la siguiente Tabla 5. Este Ejemplo utilizó componente de tinta GS.

Tabla 5

TRATADA	L*	A*	B*	DELTA E
Magenta	46.9	54.8	-5.2	Estándar
Negro 1	29.5	1.8	0.5	Estándar
Amarillo	83.6	5.0	91.8	Estándar
Cian	61.8	-27.9	-31.2	Estándar
Limpiado en Seco				
Magenta	44.7	54.6	-5.0	2.3
Negro 1	27.7	1.4	-0.3	2.0
Amarillo	82.4	4.7	90.3	1.9
Cian	60.6	-28.5	29.8	1.8

Ejemplo 24. 10.1 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) se adicionaron a 48.8 partes de agua mezclando al mismo tiempo. Se agregaron 11.5 partes húmedas de emulsión acrílica PrintRite® 591 (BF Goodrich, 43.5% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) y 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. Esta formulación se usó para tratar

popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La resistencia al lavado de las muestras vaporeadas y de las muestras no tratadas posteriormente con vapor mostraron una retención moderada del color cuando se lavaron. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 25. La formulación empleada en Ejemplo 24 se utilizó para tratar tela mezclada 85/15 nylon/lycra. Los resultados para esta tela fueron similares a los obtenidos en Ejemplo 24. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 26. 10.1 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) se adicionaron a 48.8 partes de agua mezclando al mismo tiempo. Se agregaron 11.5 partes húmedas de emulsión acrílica PrintRite® 595 (BF Goodrich, 43.5% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) y se agregaron 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. Esta formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 27. La formulación empleada en Ejemplo 26 se utilizó para tratar tela mezclada 85/15 nylon/lycra. La muestra impresa exhibió calidad de imagen superior con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado no mejoró en estas muestras. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 28. 10.1 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (5 partes secas, o alrededor de 45%

de las partes secas totales) se adicionaron a 51.2 partes de agua mezclando al mismo tiempo. Se agregaron 9.1 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etileno-vinilacetato, 55.2% en agua) (5 partes secas, o alrededor de 45% de las partes secas totales) y se agregaron 21.3 partes húmedas de suavizante de tela Varisoft® 222 (4.7% en agua) (1 parte seca, o alrededor de 9% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. Esta formulación se usó para tratar popelina de algodón 100% por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 29. La formulación empleada en Ejemplo 28 se utilizó para tratar tela mezclada 85/15 nylon/lycra. La muestra impresa exhibió calidad de imagen superior con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado no mejoró en estas muestras. Este Ejemplo utilizó componente de tinta GS.

Ejemplo 30. 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 18-19% de las partes secas totales) se adicionaron a 881.9 partes de agua mezclando al mismo tiempo. Se agregaron 181.3 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etileno-vinilacetato, 55.2% en agua) (100 partes secas, o alrededor de 74% de las partes secas totales) y se añadieron 11.1 partes húmedas de suavizante de tela Varisoft® 222 (90% en agua) (10 partes secas, o alrededor de 7% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar una tela de poliéster/pendón de algodón de 250 denier por medio de la aplicación de un engomado y se secó. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. Las muestras impresas exhibieron calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporización u otros pasos.

Ejemplo 31 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 18-19% de las partes secas totales) se adicionaron a 878.0 partes de agua

mezclando al mismo tiempo. Se agregaron 181.3 partes húmedas de emulsión de látex Airflex® 540 (copolímero de etilen-vinilacetato, 55.2% en agua) (100 partes secas, o alrededor de 74% de las partes secas totales) y 15.0 partes húmedas de suavizante de tela Adogen® 432 (66.7% en agua) (10 partes secas, o alrededor de 7% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar una tela de poliéster/pendón de algodón de 250 denier por medio de la aplicación de un engomado y se secó. La muestra se imprimió como se describe en Ejemplo 1. Las muestras impresas exhibieron calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporización u otros pasos. Las muestras textiles en Ejemplos 30 a 35 se imprimieron con componente de tinta Encad GO obtenido de la Encad Inc.

Ejemplo 32. La formulación empleada en Ejemplo 31 se utilizó para tratar una tela de popelina de poliéster. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos de curado.

Ejemplo 33. La formulación empleada en Ejemplo 31 se utilizó para tratar una tela de satín de poliéster. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos de curado. Adicionalmente, la muestra poseía excelente reflectividad visual al color. Dicha calidad puede observarse visualmente o medirse mediante métodos de reflectancia difusa.

Ejemplo 34. La formulación empleada en Ejemplo 31 se utilizó para tratar una tela de popelina de poliéster. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos.

Ejemplo 35. La formulación empleada en Ejemplo 31 se utilizó para tratar una tela de satín de poliéster. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. La permanencia del color al lavado se incrementó dramáticamente sin vaporeo u otros pasos. Adicionalmente, la muestra poseía excelente reflectividad al color.

Ejemplo 36. 50.7 partes húmedas de copolímero catiónico CP 7091 RV (ECC International) (49.3% en agua) (25 partes secas, o alrededor de 17% de las partes secas totales) se adicionaron a 993.5 partes de agua mezclando al mismo tiempo. Se agregaron 230.9 partes húmedas de emulsión acrílica PrintRite® 591 (BF Goodrich, 43.3% en agua) (100 partes secas, o alrededor de 68-69% de las partes secas totales) y 296.3 partes húmedas de suavizante de tela Varisoft® 475 (6.8% en agua) (20 partes secas, o alrededor de 13-14% de las partes secas totales) y toda la solución se mezcló hasta hacerse homogénea. La formulación se usó para tratar charmeuse de seda 100% por medio de la aplicación de un engomado y se secó. El levantamiento húmedo fue de 140%. La muestra se imprimió y evaluó empleando el proceso descrito en Ejemplo 1. La muestra impresa exhibió calidad superior de imagen con poco o ningún flujo capilar, excelente retención de tinta y excelente densidad del color. Las muestras que no se vaporizaron presentaron buena retención del color cuando se lavaron. Las muestras que se vaporizaron presentaron excelente intensificación de color y apariencia. La permanencia del color al lavado se incrementó dramáticamente comparada con las muestras no tratadas. El Ejemplo utilizó componente de tinta GS.

Resultados de los Ensayos 30-36

Las imágenes impresas sobre las muestras textiles de los Ejemplos 29-35 fueron resistentes al agua y exhibieron resistencia aceptable a la luz para estabilidad en exteriores de acuerdo con el método de ensayo ASTM G26 cuando se imprimieron con tintas Encad GO. El método de ensayo ASTM G26 incluía los siguientes pasos:

La práctica estándar bajo ASTM G26 para operar a exposición a la luz (tipo arco de xenón) con y sin agua para exposición de materiales no metálicos consta de los siguientes procedimientos. El método de ensayo 1 se empleó para exposición continua a la luz y exposición intermitente a rociado de agua. El tipo de aparato utilizado consistió en un aparato Atlas Ci 5000. El instrumento se programó para luz continua y rociado intermitente de agua de acuerdo con las instrucciones del fabricante. Se empleó el ciclo convencional de 102 minutos de exposición a la luz seguido por un ciclo de 18 minutos de luz y rociado de agua. Dichas mediciones de datos de muestra se reflejan en la siguiente Tabla 6. El método de modo de impresión es doble impacto, con 102 minutos de luz, 18 minutos de rociado luego de 6 horas.

De los datos experimentales se determinó que los recubrimientos deseables por tipo de tela son los siguientes: popelina de algodón y jersey de punto emplean deseablemente el recubrimiento descrito en Ejemplo 21 con alrededor de 13% de sólidos totales; seda crepe de chine

y charmeuse utilizan el recubrimiento descrito en Ejemplo 36 con alrededor de 7% de sólidos totales; georgette de poliéster utiliza el recubrimiento descrito en Ejemplo 30 con alrededor de 32% de sólidos totales; satín de poliester y dacrón de poliéster utilizan el recubrimiento previo (Ejemplo 30) con alrededor de 32% de sólidos totales; y popelina de poliéster utiliza el mismo recubrimiento con entre alrededor de 20-25% de sólidos totales.

Si se desea tratamiento posterior textil (es decir, un paso de calentamiento, como vaporeo, calentamiento en horno, planchado, u otra forma de paso de curado) todavía otra modalidad alternativa de la presente invención se refiere a formulaciones de tratamiento/ recubrimiento y métodos relacionados para tratar sustratos textiles que mejoran el brillo, la adhesión y/o la resistencia al lavado/resistencia a los detergentes de un tinte reactivo para inyección de tinta, tinte ácido y tintas a base de pigmentos sobre sustratos de tela textil, que utiliza una solución de embebido en conjunción con un recubrimiento de sustrato. Para los propósitos de esta solicitud, una solución de embebido significará una solución empleada para saturar una tela de manera que penetre los espacios intersticiales de la tela. La solución de recubrimiento (o tratamiento, como se describió anteriormente) puede incluir ella misma la solución de embebido, o como alternativa, la solución de recubrimiento y la solución de embebido pueden aplicarse en pasos separados de aplicación.

Las formulaciones de tratamiento o recubrimiento en la presente invención constan principalmente de polímeros catiónicos, aglutinantes, suavizantes de tela y otros aditivos similares a los descritos previamente. No obstante, en conjunción con estas formulaciones de recubrimiento, una solución de recubrimiento se emplea para tratar aún más el sustrato de tela. Por ejemplo, en una primera modalidad que utiliza la solución de embebido con componentes de tinta reactiva, una solución de embebido conformada por bicarbonato de sodio o carbonato de sodio y urea (para un brillo adicional de color con tratamiento posterior) se emplea como un tratamiento acuoso de tela recubierta. Deseablemente la solución de embebido se aplica en un nivel de entre alrededor de 5-20% en peso, más deseablemente 5-10% en peso dependiendo del tipo de tela, y usando un método estándar de saturación/engomado. Cuando la solución de embebido se hace parte de la composición de recubrimiento acuoso, el bicarbonato de sodio, carbonato de sodio, o combinación, se encuentra deseablemente presente en la solución de embebido/recubrimiento en una cantidad entre alrededor de 3 y 10 por ciento de los sólidos totales. Deseablemente, la urea se halla presente en la solución de embebido/recubrimiento combinado en una cantidad entre alrededor de 5 y 12 por ciento de los sólidos totales. Pueden incluirse otros aditivos en

la solución de embebido/recubrimiento combinado, tales como agentes humectantes y antiespumantes. Si los aditivos están presentes en la formulación, lo están deseablemente en una cantidad entre alrededor de 0.1 y 1 por ciento de los sólidos totales. Por ejemplo el agente humectante Q2-511 puede incluirse en la solución de embebido/ recubrimiento combinado. Opcionalmente, pueden incluirse también fijadores de tinte en la formulación en menos de alrededor del 5% de los sólidos totales.

Cuando la solución de embebido se aplica como solución separada a continuación de la aplicación de la formulación de recubrimiento, el bicarbonato de sodio/carbonato de sodio se halla también deseablemente presente en una cantidad entre alrededor de 30 y 40 por ciento de los sólidos totales. La urea se encuentra presente en la solución separada de embebido en una cantidad entre alrededor del 50 y 70 por ciento de sólidos. Cuando la solución de embebido se utiliza como una solución separada de la formulación de recubrimiento, puede incluir también un agente humectante en solución así como otros aditivos en las mismas cantidades que la anterior modalidad. Agua está presente en la solución en una cantidad entre alrededor de 10 y 90 por ciento de la solución. Como se expuso, esta modalidad de solución de embebido se usa deseablemente con las clases de colorante reactivo, incluyendo aquellas que pueden aplicarse por medio del proceso de impresión con inyección de tinta tal como las monoclorotriazinas y/o sulfonas de vinilo.

En una segunda modalidad que emplea una solución de embebido, la solución de embebido acuoso incluye sulfato de amonio y urea para un brillo adicional del color con tratamiento posterior. Tal como se ha expuesto para la modalidad anterior, la solución de embebido puede ser una parte del recubrimiento inicial o una solución separada. En esta modalidad, el sulfato de amonio se halla deseablemente presente en una cantidad entre alrededor de 5 y 10 por ciento de los sólidos totales, cuando se usa como parte de la formulación de recubrimiento. La urea se encuentra deseablemente presente en la solución de embebido/ recubrimiento combinado en una en una cantidad entre alrededor de 2 y 5 por ciento de los sólidos totales. Cuando la solución de embebido es una solución separada de la solución de recubrimiento, el sulfato de amonio se encuentra presente en una cantidad entre alrededor de 30 y 40 por ciento de los sólidos totales. La urea se encuentra presente en esta solución separada de embebido en una cantidad entre alrededor de 50 y 70 por ciento de los sólidos totales. Otros aditivos pueden incluirse en la solución de embebido/recubrimiento combinado tales como agentes humectantes, tensioactivos y antiespumantes. Por ejemplo, el agente humectante Q2-5211 puede incluirse en la solución de embebido/ recubrimiento combinado. Opcionalmente, pueden incluirse también

fijadores de tinte en la formulación de recubrimiento en menos de alrededor del 5 por ciento de los sólidos totales. Para reiterarlo, cuando la solución de embebido se emplea como una solución separada de la formulación de recubrimiento, la solución incluye también agua y, opcionalmente, agentes humectantes. La segunda modalidad tiene que usarse con la clase de tinte ácido que incluye aquellos que pueden aplicarse por medio de procesos de impresión de inyección de tinta. La solución de embebido se aplica deseablemente en un nivel de 5-20% en peso, dependiendo del tipo de tela, y usando un método estándar de saturación/engomado. Más deseablemente, la solución de embebido se aplica en un nivel de 10-15% en peso. Debe notarse que cuando la solución de embebido para las modalidades ya descritas tiene que hacerse en forma separada de la formulación de recubrimiento, pueden mezclarse en una relación 50/50 con la formulación de recubrimiento a aplicarse simultáneamente o, como alternativa, la formulación de recubrimiento puede aplicarse primero a la tela, secarse la tela y luego puede aplicarse la solución de embebido a la tela y después secarse.

Sustratos textiles para uso con los métodos de tratamiento pueden incluir algodón, seda, lino, poliéster, rayón, nylon y mezclas de los mismos. Convencionalmente, se emplean tintes reactivos para sustratos de algodón y tintes ácidos para sustratos de seda y nylon. Sin embargo, debido al tratamiento de recubrimiento y al tratamiento de fijación (solución de embebido) asociado con él, la invención permite la fijación de clases de tintes sobre sustratos con los que no están normalmente asociados, o que no se elaborarían comercialmente porque la fijación no es normalmente fácil ni eficiente. Como se demuestra por el conjunto de ejemplos que siguen, los sustratos revelados receptivos de inyección de tinta, que han sido tratados adicionalmente con una solución de embebido, proporcionan una alta densidad y saturación del color, calidad superior de impresión, reducción del empabilamiento o flujo capilar y mejor absorción de la tinta. Más aún, las formulaciones de recubrimiento o tratamiento proporcionan una imagen impresa con mejor resistencia al agua/detergente cuando se imprime con un proceso de impresión de inyección de tinta con pasos de tratamiento después de la impresión, tales como calentamiento, vaporeo, fijación química o curado por radiación. Con un proceso convencional de vaporeo, ocurre un desteñido mínimo del tinte, presentándose así un desperdicio mínimo del tinte.

Esta modalidad alternativa de la presente invención se describe con más detalle por el conjunto de ejemplos que siguen. Dichos ejemplos, sin embargo, no pretenden ser interpretados como limitantes en ninguna forma del espíritu o la órbita de la presente invención.

CONDICIONES DE LOS EJEMPLOS:

Se crearon una serie de recubrimientos incluyendo polímeros catiónicos, suavizantes de tela, aglutinantes de látex, otros aditivos y agua. Los recubrimientos se identifican más adelante con los respectivos porcentajes de contenido. Debe notarse que ciertos recubrimientos incluían una solución de embebido en su formulación mientras que otros no y, en consecuencia, se utilizó una solución de embebido en un paso separado de aplicación. Los tamaños de los lotes se expresan en gramos.

Primer recubrimiento (similar al usado en el Ejemplo previo 21), mencionado como Tipos A, B & D en los ejemplos que siguen, para empleo con telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE (GRAMOS)
CP7091RV	49.3	18.50	37.53	18.01
Airflex 540	55.17	37.00	67.07	32.19
PrintRite 591	43.50	37.00	85.06	40.83
Varisoft 475	10.00	7.40	74.00	35.52
Agua			569.69	273.45
	12	100	833.33	400

Solución de Embebido Separada mencionada como Tipo C para empleo con telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
Bicarbonato de Sodio	63.40	3.00	4.73	22.70
Urea	95.00	5.00	5.26	30.81
Q2-5211	100.00	0.20	0.20	1.17
Agua			58.34	341.49
	12	8.2	68.33	Aprox. 400

Las concentraciones Dyeset (poliamidas), designadas como Dyeset Conc. En las Tablas que siguen, se obtuvieron de Sybron Chemicals de Wellford, Carolina del Sur, junto con Dyeset NOZ y Dyeset NFS. Tales materiales son fijadores de tinte para tintes reactivos. El Q2-5211 que es un agente humectante, se obtuvo de Dow Corning. El bicarbonato de sodio puede obtenerse de VWR de Norcross, Georgia y Baker Chemical, y la urea puede obtenerse de Baker Chemical.

El "Combo", que es una combinación de una solución de recubrimiento y embebido, mencionada en los ejemplos que siguen como Tipo F, para empleo con telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	16.50	33.47	16.06
Airflex 540	55.17	35.00	63.44	30.45
PrintRite 591	43.50	35.00	80.46	38.62

Varisoft 475	10.00	5.40	54.00	25.92
Bicarbonato de Sodio	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Agua			591.97	284.15
	12	100	833.33	400

Recubrimiento (similar al del Ejemplo previo 21), mencionado como Tipo F en los siguientes ejemplos, empleado para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	17.50	35.50	17.04
Airflex 540	55.17	36.00	65.25	31.32
PrintRite 591	43.50	36.00	82.76	39.72
Varisoft 475	10.00	7.40	74.00	35.52
Dyeset NOZ	12.20	3.00	24.59	11.80
Q2-5211	100.00	0.20	0.20	0.10
Agua			551.23	264.59
	12	100	833.33	400

Recubrimiento, mencionado como Tipo G en los ejemplos que siguen, empleado para algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	17.50	35.50	17.04
Airflex 540	55.17	36.00	65.25	31.32
PrintRite 591	43.50	36.00	82.76	39.72
Varisoft 475	10.00	7.40	74.00	35.52
Dyeset NFS	36.70	3.00	8.17	3.92
Q2-5211	100.00	0.20	0.20	0.10
Agua			567.65	272.47
	12	100	833.33	400

Recubrimiento, mencionado como Tipo H en los siguientes ejemplos para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	17.50	35.50	17.04
Airflex 540	55.17	36.00	65.25	31.32
PrintRite 591	43.50	36.00	82.76	39.72
Varisoft 475	10.00	7.40	74.00	35.52
Dyeset Conc.	47.60	3.00	6.30	3.03
Q2-5211	100.00	0.20	0.20	0.10
Agua			569.52	273.37
	12	100	833.33	400

Recubrimiento, mencionado como Tipo I en los siguientes ejemplos para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	15.50	31.44	15.09
Airflex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset Conc.	47.60	3.00	6.30	3.03
Bicarbonato de Sodio	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Agua			591.81	284.07
	12	100	833.33	400

Recubrimiento, mencionado como Tipo J en los ejemplos que siguen para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	15.50	31.44	15.09
Airflex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset NOZ	12.20	3.00	24.59	11.80
Bicarbonato de Sodio	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Agua			573.52	275.29
	12	100	833.33	400

Recubrimiento, mencionado como Tipo K en los siguientes ejemplos para telas de algodón

ORDEN DE ADICIÓN DE LOS INGREDIENTES	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
CP7091RV	49.30	15.50	31.44	15.09
Airflex 540	55.17	34.00	61.63	29.58
PrintRite 591	43.50	34.00	78.16	37.52
Varisoft 475	10.00	5.40	54.00	25.92
Dyeset NFS	36.70	3.00	8.17	3.92
Bicarbonato de Sodio	63.40	3.00	4.73	2.27
Urea	95.00	5.00	5.26	2.53
Q2-5211	100.00	0.20	0.20	0.10
Agua			589.94	283.17
	12	100	833.33	400

Debe notarse que los recubrimientos mencionados pueden usarse en una variedad de textiles incluyendo seda y nylon. Adicionalmente, el siguiente recubrimiento puede emplearse para nylon/lycra y sustratos de seda cuando se utilizan tintes ácidos.

Recubrimiento, usado para telas de Nylon/Lycra y seda con conjuntos de tintes ácidos

ORDEN DE ADICIÓN DE LOS INGREDIENTES		% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
5	Reten 294LS	17.95	25.00	139.28	452.62
2	AirFlex 540	55.27	100.00	181.26	589.06
3	VS475	10.00	20.00	200.00	649.97
4	Q2-5211	100.00	2.70	2.70	8.77
		1.00	0.00	0.00	0.00
		1.00	0.00	0.00	0.00
1	Agua			707.60	2299.58
		12	147.7	1230.83	4000

La solución de recubrimiento y embebido puede verterse conjuntamente como se describe más adelante. La fórmula separada de fijación de tinte ácido (solución de embebido, sin solución de recubrimiento) incluye agua desionizada en el rango de alrededor de 30-90%, pero más deseablemente en alrededor de 83% en peso, sulfato de amonio en el rango de alrededor de 30 a 40% de sólidos totales, urea en el rango de alrededor de 50 a 70% de sólidos, y un tensioactivo opcional en el rango de alrededor de 0.1-1.0, como Surfyno 465, con 0.2% en peso. La fórmula de fijación del tinte ácido ya descrita (solución de embebido ácida) usada con un recubrimiento particular, tal como los recubrimientos descritos como similares al Ejemplo preliminar 21 (descritos en la sección de tinte reactivo) o el recubrimiento listado inmediatamente arriba, vertiéndose en el recubrimiento en una relación 50/50 y luego aplicado al sustrato como se describió previamente, en oposición a aplicándose en un paso separado de aplicación. Para el sustrato de seda en particular, el recubrimiento utilizado se combinó en una relación 50/50 con la solución de embebido ácida. Alternativamente, el recubrimiento y la solución de embebido pueden combinarse, como en la formulación descrita más adelante.

Recubrimiento, usado para sustratos de telas de Nylon/Lycra y seda, con conjuntos de tintes ácidos, incluyendo el recubrimiento preliminar y la solución de embebido

ORDEN DE ADICIÓN DE LOS INGREDIENTES ANOTADOS POR NÚMERO	% DE SÓLIDOS TOTALES	PARTES SECAS	PARTES HÚMEDAS	TAMAÑO DEL LOTE
7 CP7091RV	49.3	15.5	31.4	19.51
4 AirFlex 540	55.17	34	61.6	38.25
6 PrintRite	43.5	34	78.2	48.51
5 Varisoft 475	10	20.4	204.0	126.62
3 Sulfato de Amonio	100	7	7.0	4.34
2 Urea	95	5	5.3	3.27
1 Agua			584.4	362.75

	12.00	116	966.67	600

Ejemplos de Tinte Reactivo

Ejemplo 1

En este y en los siguientes ejemplos, se evaluaron muestras de tela de 11 por 15 pulgadas. En Ejemplo 1, las muestras se recubrieron primero y luego se embebieron. En particular, la tela se recubrió primero mediante un procedimiento de inmersión y exprimido/engomado como se ha descrito previamente, empleando el recubrimiento A y después se secó en un horno de aire forzado a 100°C durante 30 segundos. A continuación de este paso, la muestra de tela se embebió en un método de inmersión y exprimido/engomado usando la solución de embebido C y se secó nuevamente en el horno a 100°C durante 30 segundos. Para cada ejemplo (salvo lo anotado en contrario) se ensayaron cuatro hojas de muestra de tela. Con el fin de obtener buenos atributos de mano, la meta para el levantamiento seco porcentual estuvo entre 7 y 9. El levantamiento seco porcentual se calculó de acuerdo con la siguiente serie de ecuaciones. Estas ecuaciones se describen en Wellington Sears Handbook of Industrial Textiles, por Sabit Adanur, PH.D., copyright 1995, página 179.

Levantamiento Húmedo (%) = Peso de la formulación de levantamiento X 100

Peso de la tela seca

Adición (%) = Concentración de Formulación (%) X Levantamiento Húmedo (%)

A partir de esto se utilizó la siguiente ecuación para llegar a los valores en las tablas de % de levantamiento.

% Levantamiento seco = (Peso Húmedo/Base) X 100) – 100 X % de Sólidos (TS)

Resultados del Ejemplo 1

OBJETIVO: EMBEBER TELA DE POPELINA DE ALGODÓN UTILIZANDO UN TIPO A DE RECUBRIMIENTO Y SOLUCIÓN DE EMBEBIDO SEPARADA. T.S. * DE 11.6 EN PORCENTAJE			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	14.1	24.29	8.4
2	14.1	24.21	8.4
3	14.3	24.74	8.5
4	14.3	25.28	9.0

*T.S. representa los sólidos totales (porcentaje), BW representa el Peso Base.

Ejemplo 2

En este ejemplo, las muestras de tela se embebieron primero utilizando solución de embebido Tipo C y luego se recubrieron con Recubrimiento Tipo B empleando los procedimientos descritos en el Ejemplo previo 1.

OBJETIVO: EMBEBER POPELINA DE ALGODÓN UTILIZANDO TIPO B con T.S. 11.6/T.S. 10.6						
Paso de Embebido				Paso de Recubrimiento T.S. 10.6		
MUESTRA #	BW en g/m^2	Peso Húmedo en g	% Levantamiento Seco	BW en g/m^2	Peso Húmedo en g	% Levantamiento Seco
1	10.85	22.71	12.6	12.42	22.20	8.4
2	10.87	22.88	12.7	12.38	21.35	7.7
3	10.8	22.16	12.2	12.34	22.22	8.5
4	10.9	22.46	12.3	11.74	20.94	8.3

Ejemplo 3

En este ejemplo las muestras de tela se embebieron únicamente con la solución Tipo C.

OBJETIVO: EMBEBER POPELINA DE ALGODÓN CON SOLUCIÓN TIPO C CON T.S. DE 12			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.83	21.92	11.8
2	10.58	21.63	12.1
3	9.69	19.75	12.1
4	9.7	20.6	12.9

Ejemplo 4

En este ejemplo las muestras de tela se recubrieron únicamente con recubrimiento Tipo D.

OBJETIVO: RECUBRIR MUESTRAS DE TELA ÚNICAMENTE CON TIPO D/ T.S. 10.6			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	9.73	18.46	9.5
2	9.84	18.54	9.3

3	10.73	20.79	9.9
4	10.76	20.93	10.1

Ejemplo 5

En este ejemplo las muestras de tela se recubrieron con la solución Combo Tipo E.

OBJETIVO: TRATAR TELAS CON SOLUCIÓN COMBO/T.S. 11.4, TIPO E			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.97	21.14	10.6
2	10.74	20.47	10.3
3	10.75	20.62	10.5

Ejemplo 6

En este ejemplo las muestras de tela se recubrieron con recubrimiento Tipo F.

OBJETIVO: RECUBRIMIENTO TIPO F; DYESET NOZ Y T.S. 11.1			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.84	21.7	11.1
2	11.02	21.29	10.3
3	10.87	21.26	10.7

Ejemplo 7

En este ejemplo las muestras de tela se recubrieron con recubrimiento Tipo G.

OBJETIVO: RECUBRIMIENTO TIPO G; DYESET NSF Y T.S. 11.68			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.84	21.1	11.1
2	10.85	20.7	10.6
3	10.77	20.7	10.8

Ejemplo 8

En este ejemplo las muestras de tela se trataron con el recubrimiento Tipo H.

OBJETIVO: TIPO H/DYESET CONC. T.S. 11.2			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.86	21.1	10.5
2	10.86	21.3	10.6
3	10.86	20.6	10.4

Ejemplo 9

En este ejemplo las muestras de tela se trataron con el recubrimiento Tipo I.

OBJETIVO: TIPO I/CONC. T.S. 11.4			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.6	20.9	11.1
2	10.9	21.4	10.9
3	10.8	21.2	10.9

Ejemplo 10

En este ejemplo las muestras de tela se trataron con el recubrimiento Tipo J.

OBJETIVO: TIPO J/NOZ. T.S. 11			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	10.98	21.4	10.5
2	10.78	21.2	10.6
3	10.72	21.73	10.2

Ejemplo 11

En este ejemplo las muestras de tela se trataron con el recubrimiento Tipo K.

OBJETIVO: TIPO K/NFS			
#	BW Seco en g/m^2	Peso Húmedo en g	% de Levantamiento Seco
1	12.2	24.1	11.7
2	12.2	23.8	11.4
3	10.7	20.8	11.3

Resultados de los Ejemplos de Tinte Reactivo

Cada una de las muestras se expusieron en la mitad de su área a un iluminante D65/10° (luz de día estándar) para determinar si ocurría algún amarillamiento. También se imprimió una muestra de cada una empleando la impresora TX-1500 de Encad y un componente de tinta disponible de Kimberly-Clark Printing Technology, Inc. de Escondido, California bajo las designaciones 17960-17970. Antes de la impresión, la muestra de tela se laminó primero en un respaldo como se ha descrito previamente en el primer conjunto de ejemplos. Los ejemplos de tintes reactivos usados incluían azul reactivo 49 y negro 5 disponibles de compañías tales como DyStar y BASF Corporation. Los componentes de tinte reactivos utilizaron sulfonas de vinilo y monoclorotriazinas.

Puesto que los tintes reactivos no se inyectan típicamente a chorro debido al nivel de particulados y otros componentes de sales en los tintes se desarrolló componente de tinte para ensayar con los recubrimientos. Se supone que otros componentes de tinte podrían usarse también en conjunción con los recubrimientos, tales como los tintes disponibles de Ciba. Las muestras tinturadas se secaron de un día para otro en la oscuridad.

Se demostró que Tipo A solamente trabajó bien después del vaporeo. La exposición del Tipo A al lavado con agua fue aceptable antes del vaporeo pero el lavado con detergente demostró desteñido considerable. Tipo B demostró trabajar bien sin vaporeo pero tuvo algunos problemas de redeposición sobre la tela. Tipo C demostró tener el mayor desteñido de todas las muestras ensayadas sin vaporeo y tener una apariencia visualmente deteriorada. Luego de vaporizar, los resultados para Tipo C mejoraron mucho. Tipo D demostró resultados positivos a través de todas las muestras pero falló en el ensayo de mancha de agua y muestras impresas. Solamente después de lavar y/o luego del vaporeo y lavado la muestra Tipo D pasó el ensayo de mancha de agua. Tipo E demostró resultados muy aceptables, ocurriendo el manchado de agua únicamente en la muestra impresa. Tipo E demostró resultados deficientes en lavado con detergente sin ningún paso de procesamiento posterior. Tipo F demostró apariencias visuales positivas como lo hicieron las muestras Tipo H. Las muestras de Tipo G no pasaron la mayor parte de las pruebas. Los Tipos I, J y K demostraron cada uno relativamente los mismos resultados positivos, aunque Tipo K mostró un mejor desempeño en términos de apariencia y lavabilidad.

Para los propósitos de esta solicitud el ensayo de mancha de agua comprendió el Método de 104-1994 AATTC. En esencia, en este ensayo se pone una gota de agua sobre un sustrato y luego se frota hacia

abajo utilizando una varilla de vidrio. A continuación se observa el sustrato para ver si quedó una mancha de agua luego de que ésta última seque. Si aparece un círculo blanco, entonces se considera que se ha dejado una mancha de agua.

Pueden emplearse otros componentes de tinta de tinte con estos recubrimientos incluyendo los disponibles de Kimberley-Clark Printing Technology, Inc. bajo las designaciones TXCR-500 Negro, TXCR-520 Rojo, TXCR-523 Rojo Medio, TXCR-526 Escarlata, TXCR-530 Anaranjado, TXCR-540 Amarillo, TXCR-545 Amarillo Oro, TXCR-550 Verde, TXCR-560 Turquesa, TXCR-565 Turquesa Medio, TXCR-570 Azul y TXCR-580 Gris. Estos componentes de tinta de tinte reactivo se ensayaron con los recubrimientos mencionados imprimiéndolos con una impresora Colorspan DM XII de 12 colores/600 dpi.

Alternativamente, en lugar de usar componentes de tinte reactivo, pueden utilizarse componentes de tinta de tinte ácido con soluciones fijadoras de tinte ácido (soluciones de embebido). Sustratos textiles que pueden emplear los componentes de tinte ácido incluyen algunos como aquellos con fibras que son tinturables con tintes ácidos, hebras continuas mezcladas, siempre y cuando la relación sea como mínimo del 15% entre nylon y otros materiales tales como lycra y poliamidas. Dichos componentes de tinte ácido se encuentran disponibles de Kimberly-Clark Printing Technology, Inc. bajo la designación 17972-17975. Componentes adicionales de tinte ácido se hallan disponibles de Kimberley-Clark Printing Technology, Inc. bajo las designaciones 7287-20-2 Negro, 7287-27-2 Gris, 6869-184-5 Violeta, 7287-21-1 Azul, 7287-24-2 Azul Claro, 7287-10-1 Turquesa y 7287-25-1 Verde, 6869-186-3B Magenta, 7287-24-1 Magenta Claro, 6869-184-10 Escarlata, 7287-15-1 Anaranjado, 7287-6-1 Amarillo. Dichas tintas se ensayaron con los recubrimientos ya descritos utilizando la impresosa Colorspan DM XII previamente descrita.

Utilizando dichos compuestos de tinte, se provee una solución de inyección de tinta a un proceso convencional de impresión de pantalla que emplea tintes ácidos y un sustrato tratado. Proporcionando una alternativa digital a este mercado se reducirá sensiblemente el costo de manufactura de los textiles y permitirá que se elaboren más productos hechos al gusto del consumidor.

Ejemplos de Tinte Ácido

Se preparó una tela de nylon recubierta y embebida en una forma similar a las muestras de tela previamente descritas y se imprimieron con

una impresión de prueba sobre la muestra seca. La muestra se lavó en agua caliente sin desteñido aparente del tinte.

En un segundo conjunto de ejemplos, componentes de tinte ácido se utilizaron sobre muestras de tela charmeuse de seda y Nylon/Lycra. Como en los ejemplos anteriores, se cortaron muestras de hoja de tela de 11 por 15 pulgadas y la tela se ensayó luego de acuerdo con varios recubrimientos de ensayo. Debe anotarse que estas telas no se pueden imprimir directamente mientras estén sin recubrir. Los resultados para sólo lavado demuestran un Delta E de 40 para nylon/lycra y un Delta E de 35 para la charmeuse de seda sin tratamiento posterior. No obstante, después del tratamiento posterior para telas recubiertas los valores de Delta E fueron ambos de alrededor de 1.5 o menos. El tratamiento posterior consistió en vaporizar.

Las formulaciones de tratamiento/recubrimiento y los métodos que son objeto de esta invención proporcionan sustratos textiles imprimibles con inyección de tinta que poseen características de impresión y calidad de imagen, una mejora notoria del color, calidad y densidad del color, capacidad de retención de tinta y propiedades de resistencia al agua y los detergentes. Dichas formulaciones pueden usarse para preparar artículos de manufactura como se describió anteriormente.

Aunque la invención se ha descrito en detalle con referencia particular a una modalidad preferida de la misma, debe entenderse que se pueden hacer muchas modificaciones, adiciones y eliminaciones a ella sin apartarse del espíritu y la órbita de la invención como se expone en las siguientes reivindicaciones.

REIVINDICACIONES

Lo que se reivindica es:

1. Un método para tratar un sustrato con el fin de mejorar la adhesión, la resistencia del color y la resistencia de lavado de una tinta, a base de tinte reactivo, impresa con inyección de tinta sobre el sustrato, que se expondrá a un paso de tratamiento posterior a continuación de la impresión, método que comprende:

tratar un sustrato con una formulación de polímeros catiónicos y suavizantes de tela;

tratar el sustrato con una solución embebidora;

tratar posteriormente el sustrato

2. Un método para mejorar la adhesión, la resistencia del color y la resistencia de lavado de una tinta, a base de tinte reactivo, impresa con inyección de tinta sobre el sustrato, el método que comprende:

tratar el sustrato con una formulación de polímeros catiónicos y suavizantes de tela, donde dichos polímeros catiónicos están presentes en dicha formulación en una cantidad de alrededor de 5 a 95% de sólidos y dicho suavizante de tela está presente en dicha formulación en una cantidad de alrededor de 5 a 20% de sólidos;

tratar el sustrato con una solución embebidora;

secar dicho sustrato tratado;

imprimir el sustrato con inyección de tinta.

Nota del traductor. Después de la página 35 el original en inglés contiene hojas que no pertenecen al documento, los cuales no se traducen.

ES TRADUCCIÓN FIEL Y COMPLETA DEL DOCUMENTO ANEXO TERMINADA ESTE 11 DE ABRIL, 2001.