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Referencia : Expediente No. 00.083.591
Solicitante : THE DOW CHEMICAL COMPANY
Asunto : Solicitud de patente para: "COMPOSICIONES DE RESPALDO DE ALFOMBRA QUE CONTIENEN MEZCLAS DE ALCOXILATO DE SILOXANO ANIÓNICO/COSURFACTANTE ORGÁNICO COMO MEDIOS DE ESPUMACION Y USO EN LA PRODUCCIÓN DE ALFOMBRAS".
Fecha de solicitud : 2 de Noviembre de 2000.

1. Yo, Emilio FERRERO, obrando como apoderado del solicitante, en el asunto en referencia, atentamente, presento con este escrito copia certificada de la solicitud de patente estadounidense número 09/434.822 del 05 de noviembre de 1999, junto con la respectiva traducción de su carátula y reivindicaciones, de la cual se reclama prioridad en esta solicitud de patente.

2. Ruego a la Señora Jefe se sirva aceptar este escrito con sus anexos, y se continúe con el trámite de la solicitud.

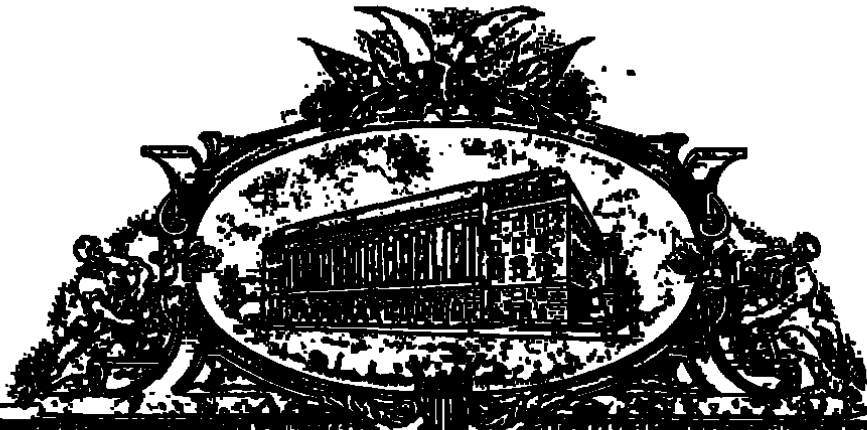
Bogotá, 29 ENE. 2001
Señora Jefe,



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COLO: 0286-801-141-8
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NIT. 860.041.367-3



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October 31, 2000

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APPLICATION NUMBER: 09/434,822

FILING DATE: November 05, 1999



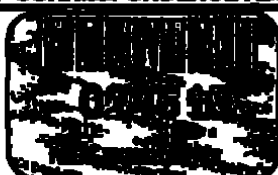
**By Authority of the
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Certifying Officer

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UTILITY PATENT APPLICATION TRANSMITTAL		Attorney Docket No. 44579	Total Pages 28
First Named Inventor or Application Identifier		Jenkins	
Express Mail Label No. EL413489829US			
CARPET BACKING COMPOSITIONS CONTAINING NONIONIC SILOXANE ALKOXYLATE / ORGANIC SURFACTANT BLENDS AS FROTHING AIDS AND THEIR USE IN PRODUCTION OF CARPETS			
APPLICATION ELEMENTS		ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20531	
1. ☒ Fee Transmittal Form (Submit an original, and a duplicate for fee processing)			
2. ☒ Specification [Total Pages 20] (preferred arrangement set forth below) - Descriptive title of the invention - Cross References to Related Applications - Statement Regarding Fed sponsored R & D - Reference to Microfiche Appendix - Background of the invention - Brief Summary of the invention - Brief Description of the Drawings (if filed) - Detailed Description - Claim(s) - Abstract of the Disclosure			
3. ☐ Drawing(s) (35 USC 113) [Total Sheets _____]			
4. ☒ Declaration and Power of Attorney [Total Pages 1] a. ☐ Newly executed (original or copy) b. ☐ Copy from a prior application (37 CFR 1.69(d)) (for continuation/divisional with Box 18 completed) (Please Box 5 below) c. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.69(d)(2) and 1.33(b).			
5. ☐ Incorporation By Reference The entire disclosure of the prior application identified in Box 18 is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.			
6. ☐ Microfiche Computer Program (Appendix)			
7. ☐ Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary) a. ☐ Computer Readable Copy b. ☐ Paper Copy (identical to computer copy) c. ☐ Statement verifying identity of above copies			
ACCOMPANYING APPLICATION PARTS			
8. ☐ Assignment Papers (cover sheet & document(s))			
9. ☐ English Translation Document (if applicable)			
10. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations			
11. ☐ Preliminary Amendment			
12. ☒ Return Receipt Postcard (MPEP 603) (Should be specifically itemized)			
13. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)			
14. ☐ Associate Power of Attorney			
15. ☐ Sealed envelope containing confidential information, which Applicants may request to be expunged from the application file.			
16. ☒ Authorization for payment of fees and Petition for Extensions of Time.			
17. ☐ Other: _____			
18. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information: Amend the specification by inserting before the first line, the sentence: "This application is a" ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____			
19. CORRESPONDENCE ADDRESS			
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Please direct any telephonic communication regarding this application to the undersigned Attorney/Agent for Applicants:  Kevin R. Hansbro Reg. No.: 38,485 Phone No.: (408) 238-8041 Fax No.: (408) 238-0878			

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Assistant Commissioner for Patents
Washington, D. C. 20231

Attorney's Case No. : 44579

Application of : Randall C. Jenkins and Richard M. Gerkin

For: CARPET BACKING COMPOSITIONS CONTAINING NONIONIC
SILOXANE ALKOXYLATE / ORGANIC COSURFACTANT BLENDS AS
FROTHING AIDS AND THEIR USE IN PRODUCTION OF CARPETS

No. of Drawing Sheets: 0

EXTRINSIC MAIL-MARKING LABEL NO. EL413489929US
DATE OF EXPORT: November 5, 1999

Sir:

Enclosed for filing is the above-identified application. Please charge the estimated fee to our Deposit Account No. 04-1512. An original and 2 copies of this sheet are enclosed.

A. Basic Filing Fee		<u>\$760.00</u>
Total Number of Claims	16	
Less (Basic Fee)	20	
B. Extra Claims	0 x \$ 18.00 = \$	
Total Number Independent Claims	3	
Less (Basic Fee)	3	
C. Extra Independent Claims	0 x \$ 78.00 = \$	
D. Multiple Dependent Claims Presented	+ \$260.00 = \$	
TOTAL FILING FEE (A+B+C+D) =		<u>\$760.00</u>

If this estimate is incorrect, please charge or credit our account accordingly.

Respectfully submitted,

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Intellectual Property Section
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Freeport, Texas 77541-3257

Date: November 5, 1999

KRH/alb

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**CARPET BACKING COMPOSITIONS CONTAINING NONIONIC SILOXANE
ALKOXYLATE / ORGANIC COSURFACTANT BLENDS AS FROTHING
AIDS AND THEIR USE IN PRODUCTION OF CARPETS**

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FIELD OF THE INVENTION

This invention relates to coatings, adhesives, and sealants as well as polyurethane-backed carpets. More particularly, it relates to aqueous polyurethane dispersions containing a nonionic siloxane alkoxyate / organic cosurfactant blend as a frothing aid and a method for applying the polyurethane dispersion to a substrate.

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DESCRIPTION OF THE PRIOR ART

Generally, tufted carpets minimally consist of tufted fibers through a primary backing and a precoat. Tufted carpets may also have additional layers such as a laminate layer, a secondary layer, and a foam layer. Moreover, the tufted carpet may have more than one secondary layer.

15

The precoat is required to anchor the carpet tufts to the primary backing. It may also contain an adhesive to adhere the tufted carpet to additional layers or the subfloor. The precoat can affect the carpet's tuft bind, hand, delaminating properties, wet strength properties, wear resistance, and barrier performance. Alternatively, a laminate layer may be applied without a precoat. However, better anchoring is achieved when a precoat is also applied than when a laminate layer is applied alone.

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Precoat, laminate, and foam layers may be prepared from several materials. They may be prepared from a butadiene-acrylonitrile latex, an ethylene-vinyl acetate latex, a styrene-butadiene-butyl acrylate latex, a chloroprene latex, a polyethylene copolymer latex, an ethylene-styrene latex, a styrene-butadiene-vinylidene chloride latex, a styrene-alkyl acrylate latex, a vinyl latex, or an acrylic latex. However, they are

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usually prepared from a polyurethane material or a styrene-butadiene latex.

With regard to polyurethane layers, conventional practice in the carpet manufacturing industry requires that a polyurethane layer be prepared from an isocyanate formulation (A-side formulation) and a polyol formulation (B-side
5 formulation) at the carpet manufacturing site. This is sometimes referred to as "A+B chemistry". Preparing a polyurethane layer by A+B chemistry can result in unpredictable loss of production and inefficiency due to problems that can occur in carrying out the reaction at the manufacturing site, such as premature gelation.

Alternatively, the polyurethane layer may be applied as an aqueous
10 polyurethane (PU) dispersion. Aqueous PU dispersions can be prepared by polymerizing the polyurethane reactants in an organic solvent followed by dispersion of the resulting solution in water, and optionally followed by removal of organic solvent. See U.S. Patent Nos. 3,437,624; 4,092,286; 4,237,264; 4,742,095; 4,857,565; 4,879,322; 5,037,864; and 5,221,710, which are incorporated herein by reference.
15 Also, an aqueous polyurethane dispersion may be prepared by first forming a prepolymer, next dispersing the prepolymer in water, and finally conducting a chain extension in the water as disclosed in WO 98/41552, published September 24, 1998, which is incorporated herein by reference. In this instance, the aqueous polyurethane dispersion will preferably have water as a continuous phase. U.S. Patent No. 4,296,159
20 to Jenkins, et al., discloses preparing a tufted or woven article having a unitary backing prepared by applying a polyurethane forming composition to the underside of the tufted or woven article.

As a polyurethane dispersion, the polyurethane layer may be applied as a blown formulation. The blown formulation is generally prepared by mixing the A-side-

components with the B-side components in the presence of a gas, which is either mechanically introduced or chemically produced, to form bubbles that yield a cell-like structure in the cured polyurethane. Mechanical whipping of gas into a polyurethane formulation is also termed "frothing."

5 As the quantity of gas is increased, the density of the resultant polyurethane layer is reduced. Blowing the formulation can reduce the coating weight of the polyurethane layer and facilitate a more uniform application of the polyurethane layer. Because the cost of the polyurethane layer is directly related to the coating weight, coating weight reductions also reduce cost.

10 To facilitate coating weight reduction in frothed styrene-butadiene latex carpet compounds, water-based anionic soaps are often used. Examples include sodium lauryl sulfate, ammonium lauryl sulfate, disodium N-octadecylsulfosuccinimate, and the like. Unfortunately, when these materials are compounded into low load styrene-butadiene latexes or low load aqueous polyurethane dispersions, detrimental consequences arise.

15 Solid levels are reduced, thereby slowing coater speed. Thickener demand is increased, which in turn, raises formulation costs. Unsightly blistering can occur and hinder installation. Additionally, the layer's cellular nature can increase such that it diminishes physical properties such as tuft bind, edge ravel, and delamination strength.

There is a need to provide a surfactant that facilitates frothing of low load

20 styrene-butadiene latexes or low load aqueous polyurethane dispersions without detrimentally affecting the polymer's performance. Also, it would be desirable to provide a surfactant, which can be used at low levels, to lower costs.

SUMMARY OF THE INVENTION

According to the present invention, a frothing aid for preparing coatings,

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adhesives, and sealants as well as for preparing a polyurethane-backed carpet is provided. The frothing aid comprises a blend of a nonionic siloxane alkoxyate and an organic cosurfactant. In particular, an aqueous polyurethane dispersion comprising a polyurethane dispersion composition and the frothing aid is provided. Moreover, a method for applying the aqueous polyurethane dispersion to a substrate is provided.

A frothing aid of the present invention is a blend of (A) a nonionic siloxane alkoxyate having the formula: $R^1Me_2SiO[Me_2SiO]_f[MeSi(Q)O]_gSiMe_2R^1$ wherein $f = 0$ to 1 ; $g = 1$ to 2 ; $Q = C_6H_{2d}O(C_2H_4O)_t(C_3H_6O)_w(C_4H_8O)_xR^2$ wherein $d = 2$ to 4 ; $t = 3$ to 12 ; $w = 0$ to 8 ; $x = 0$ to 8 , providing when w or $x > 0$, $(t+w+x) = 5$ to 12 ; R^2 is hydrogen, acetyl, or a hydrocarbon radical having 1 to 4 carbon atoms; and R^1 is Q or an alkyl having 1 to 4 carbon atoms; and (B) an organic cosurfactant having the formula: $R^3O(C_2H_4O)_a(C_3H_6O)_b(C_4H_8O)_cR^4$ wherein R^3 is an alkyl, alkenyl, aryl, or alkaryl having 8 to 16 carbon atoms; $a = 2$ to 12 ; $b = 0$ to 2 ; $c = 0$ to 2 ; and R^4 is hydrogen, acetyl, or a hydrocarbon radical having 1 to 4 carbon atoms. "Me" represents a methyl group. The molar ratio for the nonionic siloxane alkoxyate to the organic cosurfactant should be between 1:19 to 19:1.

DESCRIPTION OF THE INVENTION

In the preferred embodiment of the present invention, the aqueous polyurethane dispersion comprises a polyurethane dispersion composition and the frothing aid. The present invention is useful for preparing a coating, an adhesive, or a sealant as well as for preparing a polyurethane-backed carpet.

In the present invention, polyurethane can refer to a polyurethane compound, a polyurea compound, or mixtures thereof. A polyurethane compound can be obtained by the reaction of a polyol with a polyisocyanate. A polyurea compound can be

obtained by the reaction of an amine with a polyisocyanate. A polyurethane compound or polyurea compound can contain both urea and urethane functionality, depending on what compounds are included in the A and/or B-side formulations. For the purposes of the present application, no further distinction will be made herein between the
5 polyurethane compounds and polyurea compounds. The term "polyurethane" will be used generically to describe a polyurethane compound, a polyurea compound, and mixtures thereof.

A polyurethane dispersion composition useful in the practice of the present invention includes water, and a polymeric compound selected from the group
10 consisting of a polyurethane compound, a mixture of polyurethane-forming compounds, and mixtures thereof. Preferably, the aqueous polyurethane dispersion will have water as a continuous phase. Polyurethane-forming compounds as used in the present invention are compounds that are capable of forming polyurethane polymers. Polyurethane-forming compounds include, for example, polyurethane prepolymers.
15 Prepolymers useful in the practice of the present invention are prepared by the reaction of active hydrogen compounds with any amount of isocyanate in excess material relative to active hydrogen material. The isocyanate functionality can be present in an amount of from about 0.2 wt% to about 40 wt%. A suitable prepolymer can have a molecular weight in the range of from about 100 to about 10,000. Prepolymers useful
20 in the practice of the present invention should be substantially liquid under the conditions of dispersion.

Active hydrogen compounds can be described as compounds having functional groups that contain at least one hydrogen atom bonded directly to an electronegative

atom such as nitrogen, oxygen or sulfur. Suitable active hydrogen compounds can be polyols of molecular weight of less than about 6000.

A frothing aid of the present invention is a blend of (A) a nonionic siloxane alkoxyate having the formula



wherein $f = 0$ to 1 ; $g = 1$ to 2 ; $Q = C_2H_5O(C_2H_4O)_d(C_3H_5O)_w(C_4H_9O)_x R^2$ wherein $d = 2$ to 4 ; $t = 3$ to 12 ; $w = 0$ to 8 ; $x = 0$ to 8 , providing when w or $x > 0$, $(t+w+x) = 5$ to 12 ; R^2 is hydrogen, acetyl, or a hydrocarbon radical having 1 to 4 carbon atoms; and R^1 is Q or an alkyl having 1 to 4 carbon atoms;

10 and (B) an organic cosurfactant having the formula



wherein R^3 is an alkyl, alkenyl, aryl, or alkaryl having 8 to 16 carbon atoms; $a = 2$ to 12 ; $b = 0$ to 2 ; $c = 0$ to 2 ; and R^4 is hydrogen, acetyl, or a hydrocarbon radical having 1 to 4 carbon atoms. "Me" represents a methyl group.

15 Preferably, $f = 0$, $g = 1$, $d = 3$, $t = 4$ to 8 , R^1 is methyl, R^2 is alkyl having 8 to 12 carbon atoms, R^3 is H or Me, R^4 is H, $w = 0$, $x = 0$, $a = 5$ to 8 , $b = 0$, and $c = 0$. More preferably, $t = 7$ to 8 , R^3 is alkyl having 10 to 12 carbon atoms, and $a = 5$.

The alkylene oxides of Q and the organic cosurfactant can be random or blocked.

20 The molar ratio for the nonionic siloxane alkoxyate to the organic cosurfactant should be between 1:19 to 19:1. Preferably, the molar ratio is between 5:1 to 1:5. More preferably, the molar ratio is between 0.8:1 to 1.2:1.

Examples of the nonionic siloxane alkoxyate are available commercially from CK Witco Corporation under the trademark SILWET™. Examples of the organic

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surfactants are available commercially from CK Witco Corporation under the trademark WITCONOL™ and from Union Carbide Corporation under the trademarks TERGITOL™ and TRITON™.

A polyurethane dispersion as described herein can include chain extenders,
5 catalysts, fillers, filler wetting agents, surfactants, blowing agents, frothing agents, dispersants, foam stabilizers, thickeners, fire retardants, defoamers, pigments, antistatic agents, reinforcing fibers, antioxidants, preservatives, acid scavengers, and other materials useful in polyurethane formulations. A chain extender is used herein to build the molecular weight of the polyurethane prepolymer by reaction of the chain extender
10 with the isocyanate functionality in the polyurethane prepolymer, i.e., chain extend the polyurethane prepolymer.

A suitable chain extender is typically a low equivalent weight active hydrogen containing compound, having about 2 or more active hydrogen groups per molecule. The active hydrogen groups can be hydroxyl, mercaptyl, or amino groups. An amine
15 chain extender can be blocked, encapsulated, or otherwise rendered less reactive. Other materials, particularly water, can function to extend chain length and so are chain extenders for purposes of the present invention. Polyamines are preferred chain extenders. It is particularly preferred that the chain extender be selected from the group consisting of amine terminated polyethers such as, for example, JEFFAMINE D-400™
20 from Huntsman Chemical Company, amino ethyl piperazine, 2-methyl piperazine, 1,5-diamino-3-methyl-pentane, isophorone diamine, ethylene diamine, diethylene triamine, triethylene tetramine, tetraethylene pentamine, ethanolamine, lysine in any of its stereoisomeric forms and salts thereof, hexane diamine, hydrazine and piperazine. In the practice of the present invention, the chain extender is often used as a solution of

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chain extender in water.

Small amounts of chain extender can be advantageously used. Generally, the chain extender is employed at a level sufficient to react with from about zero (0) to about 100 percent of the isocyanate functionality present in the prepolymer, based on one equivalent of isocyanate reacting with one equivalent of chain extender. It can be desirable, under certain conditions, to allow water to act as a chain extender and react with some or all of the isocyanate functionality present.

A catalyst can be used to promote the reaction between a chain extender and an isocyanate. Suitable catalysts include tertiary amines, organometallic compounds, similar compounds, and mixtures thereof. For example, suitable catalysts include di-n-butyl tin bis(mercaptoacetic acid isooctyl ester), dimethyltin dilaurate, dibutyltin dilaurate, dibutyltin sulfide, stannous octoate, lead octoate, ferric acetylacetonate, bismuth carboxylates, triethylenediamine, N-methyl morpholine, similar compounds, and mixtures thereof. An amount of catalyst is advantageously employed such that a relatively rapid cure to a tack-free state can be obtained. If an organometallic catalyst is employed, such a cure can be obtained by using from about 0.01 to about 0.5 parts per 100 parts of the polyurethane-forming composition, by weight. If a tertiary amine catalyst is employed, the catalyst preferably provides a suitable cure using from about 0.01 to about 3 parts of tertiary amine catalyst per 100 parts of the polyurethane-forming composition, by weight. Both an amine type catalyst and an organometallic catalyst can be employed in combination.

The present invention can include conventional fillers such as milled glass, calcium carbonate, aluminum trihydrate, talc, bentonite, antimony trioxide, kaolin, fly ash, or other known fillers. A suitable filler loading in a polyurethane dispersion can be

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from about 100 to about 1000 parts of filler per 100 parts of the polyurethane compound. Preferably, the filler material can be loaded in an amount of at least about 200 pph (phr), more preferably at least about 300 pph, most preferably at least about 400 pph.

5 The present invention can include a filler wetting agent. A filler wetting agent generally renders the filler material compatible with a polyurethane-forming composition. Useful wetting agents include phosphate salts such as sodium hexametaphosphate. A filler wetting agent can be included in a polyurethane-forming composition of the present invention at a concentration of at least about 0.1 parts per
10 100 parts of filler, by weight.

Useful surfactants to make an aqueous polyurethane dispersion include cationic and anionic surfactants. Examples of anionic surfactants include sulfonates, carboxylates, and phosphates. Examples of cationic surfactants include quaternary amines. Surfactants can be either external or internal. External surfactants are
15 surfactants are not chemically reacted into the polymer during dispersion preparation. Internal surfactants are chemically reacted into the polymer during dispersion preparation. A surfactant can be included in an amount ranging from about 0.01 to about 20 parts per 100 parts by weight of polyurethane component.

Examples of suitable blowing agents are gases such as air, carbon dioxide,
20 nitrogen, argon, and helium; liquids such as water, low molecular weight hydrocarbons, and volatile halogenated alkanes; and azo-blowing agents such as azobis(formamide). Volatile halogenated alkanes include the various chlorofluoromethanes and chlorofluoroethanes. Preferable is the use of air as a blowing or frothing agent. A frothing agent can differ from a blowing agent in that frothing agents are typically

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introduced by mechanical whipping into the polyurethane formulation.

A polyurethane dispersion of the present invention can be stored for later application to a surface. Storage for this purpose requires that the dispersion be storage-stable. Alternatively, the polyurethane dispersion can be applied in a continuous manner to the surface. That is, the dispersion can be applied to the surface as the dispersion is obtained. Polyurethane dispersions applied in a continuous manner are not required to be storage-stable, and can have higher solids content and/or larger mean particle size than typical storage-stable polyurethane dispersion formulations.

A suitable storage-stable polyurethane dispersion as defined herein is any polyurethane dispersion having a mean particle size of less than about 5 micrometers; a more preferable mean particle size is less than about 1 micrometer. A polyurethane dispersion that is not storage-stable can have a mean particle size of greater than 5 micrometers. For example, a suitable dispersion can be prepared by mixing a polyurethane prepolymer with water and dispersing the prepolymer in the water using a commercial blender. Alternatively, a suitable dispersion can be prepared by feeding a prepolymer into a static mixing device along with water, and dispersing the water and prepolymer in the static mixer. Continuous methods for preparing aqueous dispersions of polyurethane are known and can be used in the practice of the present invention. For example, U.S. Patent Nos. 3,437,624; 4,092,286; 4,237,264; 4,742,095; 4,857,565; 4,879,322; 5,037,864; and 5,221,710 describe continuous processes useful for obtaining aqueous polyurethane dispersions. In addition, a continuous process for preparing an aqueous polyurethane dispersion having a high internal phase ratio is described in U.S. Patent No. 5,539,021, incorporated herein by reference.

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In preparing a frothed aqueous polyurethane dispersion, it is often preferable to premix all of the components except the polyisocyanate (and the blowing agent when a gas is used) to form a "B" component. The polyisocyanate and the B component are admixed and then the blowing agent gas is blended in using, for example, an OAKES FROTHER* (a trade designation of the E.T. Oakes Corporation). The composition is preferably applied to a textile or other substrate prior to any significant level of curing using equipment such as a doctor knife, air knife, or extruder to apply and gauge the layer. In the alternative, the composition may be applied by (1) forming it into a layer on a moving belt or other suitable apparatus, (2) dehydrating or partially curing, and (3) finally, marrying it to the substrate. It may be married with equipment such as a double belt laminator (also known as double band) or a moving belt with an applied foam cushion. The polyurethane is then allowed to cure by applying heat by means of an infrared oven, open flame forced draft convection impingement oven, heated plates or the like.

Suitable substrates include paper (e.g., release paper), metal foils, polymeric sheets (e.g., polyethylene terephthalate), wood, nonwoven fabric, rubber, and textiles. The preferred substrate is carpet.

In preparing polyurethane-backed carpets according to the present invention, an aqueous polyurethane dispersion is applied as a layer of preferably uniform thickness onto one surface of a carpet primary backing. Aqueous polyurethane dispersions of the present invention can be applied as a precoat, a laminate layer, or a foam layer. Polyurethane precoat, laminate layers, and foam layers can be prepared by methods known in the art. Precoat, laminate layers and foam layers prepared from latexes are described in P. L. Fitzgerald, "Integral Latex Foam Carpet Cushioning", J. Coat. Fab.

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1977, Vol. 7 (pp.107 - 120), and in R. P. Brentin, "Latex Coating Systems for Carpet Backing", J. Coat. Fab. 1982, Vol. 12 (pp. 82 - 91).

The polyurethane-forming composition can be applied to a substrate before it cures to a tack-free state. Alternatively, a polyurethane dispersion containing no
5 unreacted isocyanate functionality can be applied, thereby removing the need to cure the polymer.

When the substrate is carpet, the polyurethane-forming composition is typically applied to the carpet surface attached to a primary backing. The amount of polyurethane-forming composition used can vary widely, from about 5 to about 500
10 ounces per square yard (0.17 to 16.95 kg/sq. meter), depending on the characteristics of the textile.

The embodiments described herein are given to illustrate the scope and spirit of the present invention. The embodiments herein will make apparent to those skilled in the art other embodiments that may also be used. These other embodiments are within
15 the scope of the present invention. Thus, the scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the embodiments given herein.

EXAMPLES

The following examples merely exemplify various embodiments of the
20 invention. It is understood that the following examples are provided to further illustrate the invention. They do not in anyway limit the scope of the present invention.

EXAMPLE NOS. 1-3

For Example Nos. 1-3, a standard polyurethane carpet backing formulation was used. The aqueous polyurethane dispersions were frothed with compressed air.

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Comparative Example No. 1 was prepared with a sodium-based surfactant (disodium N-octadecylsulfosuccinimate) as the frothing aid. Example Nos. 2 and 3 were prepared with a frothing aid according to the present invention. To facilitate processing, one part per hundred resin (pphr) of a defoamer was added to the formulations of Example Nos.

2 and 3.

The finished carpets were analyzed according to industry conditions. The results are reported in Table 1. The data indicates that the frothing aid of the present invention facilitates lower coating weights. Moreover, the data indicates improved processing because the formation of blisters is prevented.

TABLE 1

Example	Compound Solids, %	Coat Weight (oz/yd) (g/cm)	Hand (lb.) (kg)	Delamination (lb./in) (kg/cm)	Tuft Bind (lb.) (kg)	Blister
1	79.2	45 (13.95)	12 (5.4)	10.3 (1.84)	14.6 (6.61)	Yes
2	78.8	26.3 (8.15)	12.4 (5.6)	7.2 (1.29)	11.7 (5.30)	No
3	79.2	34.3 (10.63)	16.1 (7.3)	6.1 (1.09)	14.6 (6.61)	No

EXAMPLE NOS. 4-12

For Example Nos. 4-12, another standard polyurethane carpet backing formulation was used. The aqueous polyurethane dispersions were frothed with compressed air. Comparative Example Nos. 4 and 5 were prepared with a sodium-based surfactant (disodium N-octadecylsulfosuccinimate) as the frothing aid. Example Nos. 6-12 were prepared with a frothing aid according to the present invention. To facilitate processing, about one part per hundred resin (pphr) of a defoamer was added to the formulations of Example Nos. 6-12.

The finished carpets were analyzed according to industry conditions. The

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results of selected analyses are reported in Table 2. The data indicates improved processing because the formation of blisters is prevented.

TABLE 2

Ex.	Compound Solids, %	Coat Weight (oz/yd) (g/cm)	Hand (lb.) (kg)	Delamination (lb./in) (kg/cm)	Tuft Bind (lb.) (kg)	Blister
4	79.2	43.3 (13.42)	14.7 (6.7)	6.3 (1.12)	15.9 (7.2)	Yes
5	79.2	52.5 (16.28)	23.8 (10.8)	11.1 (1.98)	15.7 (7.1)	Yes
6	78.8	30.5 (9.46)	16.7 (7.6)	6.5 (1.16)	11.1 (5.0)	No
7	79	32.7 (10.14)	18.3 (8.3)	3.8 (0.68)	15.3 (6.9)	No
8		35.8 (11.10)	19.9 (9.0)	3.8 (0.68)	15.7 (7.1)	No
9		31.2 (9.67)	17.0 (7.7)	4.3 (0.77)	12.3 (5.6)	No
10		33.6 (10.42)	16.5 (7.5)	4.1 (0.73)	15.3 (6.9)	No
11	79.2	43.4 (13.46)	20.7 (9.4)	8.4 (1.50)	20.4 (9.2)	No
12		36.0 (11.16)	16.4 (7.4)	4.8 (0.85)	15.3 (6.9)	No

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What is claimed is:

1. An aqueous polyurethane dispersion comprising:
 - a. a polyurethane dispersion composition and
 - b. a frothing aid prepared by mixing
 - i. a nonionic siloxane alkoxyate having the formula

$$R^1Me_2SiO[Me_2SiO]_f[MeSi(Q)O]_gSiMe_2R^1$$
 wherein $f = 0$ to 1 ;
 $g = 1$ to 2 ;
 $Q = C_4H_9O(C_2H_4O)_d(C_3H_7O)_w(C_4H_9O)_tR^2$
 wherein $d = 2$ to 4 ;
 $t = 3$ to 12 ;
 $w = 0$ to 8 ,
 $x = 0$ to 8 , providing when w or $x > 0$,
 $(t + w + x) = 5$ to 12 ;
 R^2 is hydrogen, acetyl, or a hydrocarbon radical having 1 to 4 carbon atoms;
 and
 R^1 is Q or an alkyl having 1 to 4 carbon atoms with
 - ii. an organic cosurfactant having the formula

$$R^3O(C_2H_5O)_a(C_3H_7O)_b(C_4H_9O)_cR^4$$
 wherein R^3 is an alkyl, alkenyl, aryl, or alkaryl having 8 to 16 carbon atoms;
 $a = 2$ to 12 ;
 $b = 0$ to 2 ;

24 c = 0 to 2; and
 25 R⁴ is hydrogen, acetyl, or a hydrocarbon radical having 1
 26 to 4 carbon atoms,
 27 with a molar ratio between 1:19 to 19:1.

1 2. The aqueous polyurethane dispersion of Claim 1 wherein f = 0, g = 1, d = 3, t =
 2 4 to 8, R¹ is methyl, R³ is alkyl having 8 to 12 carbon atoms, R² is H or Me, R⁴
 3 is H, w = 0, x = 0, a = 5 to 8, b = 0, and c = 0.

1 3. The aqueous polyurethane dispersion of Claim 2 wherein t = 7 to 8, R³ is alkyl
 2 having 10 to 12 carbon atoms, and a = 5.

1 4. The aqueous polyurethane dispersion of Claim 1 wherein the molar ratio of the
 2 nonionic siloxane alkoxylate to the organic cosurfactant is between 5:1 to 1:5.

1 5. The aqueous polyurethane dispersion of Claim 1 wherein the molar ratio of the
 2 nonionic siloxane alkoxylate to the organic cosurfactant is between 0.8:1 to
 3 1.2:1.

1 6. The aqueous polyurethane dispersion of Claim 1 wherein the water is a
 2 continuous phase.

3 7. An aqueous polyurethane dispersion comprising:

- 4 a. a polyurethane dispersion composition;
 5 b. a nonionic siloxane alkoxylate having the formula



7 wherein f = 0 to 1;

8 g = 1 to 2;

9
$$Q = C_6H_{12}O(C_2H_4O)_x(C_3H_5O)_w(C_4H_9O)_zR^2$$

10 wherein d = 2 to 4;

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11 $t = 3$ to 12 ;
 12 $w = 0$ to 8 ,
 13 $x = 0$ to 8 , providing when w or $x > 0$,
 14 $(t + w + x) = 5$ to 12 ;
 15 R^2 is hydrogen, acetyl, or a hydrocarbon radical
 16 having 1 to 4 carbon atoms; and
 17 R^1 is Q or an alkyl having 1 to 4 carbon atoms; and

18 c. an organic cosurfactant having the formula

19 $R^3O(C_2H_4O)_a(C_3H_6O)_b(C_4H_8O)_cR^4$

20 wherein R^3 is an alkyl, alkenyl, aryl, or alkaryl having 8 to 16 carbon
 21 atoms;

22 $a = 2$ to 12 ;

23 $b = 0$ to 2 ;

24 $c = 0$ to 2 ; and

25 R^4 is hydrogen, acetyl, or a hydrocarbon radical having 1 to 4
 26 carbon atoms,

27 with a molar ratio of the nonionic siloxane alkoxylate to the organic surfactant
 28 between 1:19 to 19:1.

1 8. The aqueous polyurethane dispersion of Claim 7 wherein the polyurethane
 2 dispersion composition (a) has a polyol as an active hydrogen compound.

1 9. The aqueous polyurethane dispersion of Claim 8 wherein

2 $f = 0$, $g = 1$, $d = 3$, $t = 4$ to 8 , R^1 is methyl, R^3 is alkyl having 8 to 10 carbon
 3 atoms, R^2 is H or Me, R^4 is H, $w = 0$, $x = 0$, $a = 5$ to 8 , $b = 0$, and $c = 0$.

1 10. The aqueous polyurethane dispersion of Claim 9 wherein $t = 7$ to 8 , R^3 is alkyl

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2 having 10 to 12 carbon atoms, and $a = 5$.

1 11. The aqueous polyurethane dispersion of Claim 8 wherein the molar ratio of the
2 nonionic siloxane alkoxyate to the organic cosurfactant is between 5:1 to 1:5.

1 12. The aqueous polyurethane dispersion of Claim 8 wherein the molar ratio for the
2 nonionic siloxane alkoxyate to the organic cosurfactant is between 0.8:1 to
3 1.2:1.

1 13. A method for applying an aqueous polyurethane dispersion to a substrate
2 comprising:

3 a. forming an aqueous polyurethane dispersion by mixing

4 i. a polyurethane dispersion composition;

5 ii. a nonionic siloxane alkoxyate having the formula



7 wherein $f = 0$ to 1;

8 $g = 1$ to 2;



10 wherein $d = 2$ to 4;

11 $t = 3$ to 12;

12 $w = 0$ to 8,

13 $x = 0$ to 8, providing when w or $x > 0$,

14 $(t + w + x) = 5$ to 12;

15 R^2 is hydrogen, acetyl, or a hydrocarbon
16 radical having 1 to 4 carbon atoms; and

17 R^1 is Q or an alkyl having 1 to 4 carbon atoms; and

18 iii. an organic cosurfactant having the formula.....

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19 $R^3O(C_2H_4O)_a(C_3H_6O)_b(C_4H_8O)_cR^4$
 20 wherein R^3 is an alkyl, alkenyl, aryl, or alkaryl having 8 to 16
 21 carbon atoms;

22 $a = 2$ to 12 ;

23 $b = 0$ to 2 ;

24 $c = 0$ to 2 ; and

25 R^4 is hydrogen, acetyl, or a hydrocarbon radical having 1
 26 to 4 carbon atoms,

27 with a molar ratio of the nonionic siloxane alkoxylate to the organic
 28 surfactant between 1:19 to 19:1;

29 b. frothing the aqueous polyurethane dispersion; and

30 c. applying the frothed aqueous polyurethane dispersion to a substrate.

1 14. The method of Claim 13 wherein the substrate is carpet.

1 15. A polyurethane-backed carpet prepared in accordance with Claim 14.

1 16. The polyurethane-backed carpet of Claim 15 wherein the frothed aqueous
 2 polyurethane dispersion is applied as a carpet layer selected from the group consisting
 3 of a precoat, a laminate layer, and a foam layer.

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ABSTRACT

A frothing aid for preparing coatings, adhesives, and sealants as well as for preparing a polyurethane-backed carpet is provided. The frothing aid comprises a blend of a nonionic siloxane alkoxyate and an organic cosurfactant. In particular, an aqueous polyurethane dispersion comprising a polyurethane dispersion composition and the frothing aid is provided. Moreover, a method for applying the aqueous polyurethane dispersion to a substrate is provided.

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DECLARATION AND POWER OF ATTORNEY

USA/PCT

As a below named inventor, I hereby declare that:

- (a) My residence and Citizenship are as stated below my name. My P.O. (mailing) address is the same as my residence unless otherwise stated.
- (b) I verify believe I am/we are the original, first and sole/joint inventor(s) of the subject matter that is embraced by and for which a patent is sought on the invention entitled: **CARPET BACKING COMPOSITIONS CONTAINING MONOMERIC DILOXANE ALKOXYLATE / ORGANIC COSURFACTANT BLENDS AS FROTHING AIDS AND THEIR USE IN PRODUCTION OF CARPETS** and the specification of which: ☒ is attached hereto (44777).
(check one) ☐ was filed on _____ as (____).
Application No. _____
and was amended on _____

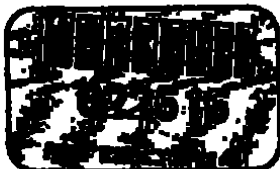
- (c) I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.
- (d) I acknowledge my duty under 37 CFR 1.56 to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR 1.56(b). If this application is a continuation-in-part application, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 CFR 1.56(b) that becomes available between the filing date of the prior application from which priority is claimed in part (f) below, and the national or PCT international filing date of this application.
- (e) I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or (365(b)) of any foreign application(s) for patent or inventor's certificate listed below or (365(a)) of any PCT international application that designated at least one country other than the United States of America listed below, and also identify below any other foreign equivalent application for patent or inventor's certificate or any other equivalent PCT international application having a filing date before that of the application on which priority is claimed:

Number	PRIOR FOREIGN APPLICATION(S) Country or PCT	Day/Month/Year Filed	PRIORITY CLAIMED	CERTIFIED COPIES INCL.
☐	Additional claims for benefit are attached.		☐	☐

- (f) I hereby claim the benefit under 35 U.S.C. § 119(a) of any United States provisional application(s) listed below, or under 35 U.S.C. § 120 of any United States application(s), or under § 365(c) of any PCT international application designating the United States of America listed below:

US or PCT Appl. Serial No.	Filing Date	Status of Application	Filing Date
☐	Additional claims for benefit are attached.		

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. Address all correspondence to The Dow Chemical Company's appointed counsel at:



This appointment, including the right to delegate this appointment, shall also apply to the same extent it is applicable under the laws of the United States of America to any proceedings established by the Patent Cooperation Treaty.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Inventor(s):

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this ____ day of _____ 19__

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At: _____
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At: _____
this ____ day of _____ 19__

Signature: _____
Full Name: _____
Residence: _____
Country: _____
Citizenship: _____
P. O. Address: _____

☐ Additional names and signatures are attached.

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LOS ESTADOS UNIDOS DE AMERICA

A TODO AQUEL A QUIEN CONCIERNA LO PRESENTE
DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS
Oficina de Patentes y Marcas de los Estados Unidos

31 de octubre de 2000

LA PRESENTE ES PARA CERTIFICAR QUE ADJUNTA A LA MISMA HAY UNA COPIA FIEL DE LOS REGISTROS DE LA OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS DE LOS DOCUMENTOS DE LA SOLICITUD DE PATENTE IDENTIFICADA EN LO QUE SIGUE, QUE CUMPLEN LOS REQUISITOS PARA OTORGARLE UNA FECHA DE PRESENTACIÓN BAJO 35 USC 111.

NÚMERO DE SOLICITUD: 60/434,822
FECHA DE PRESENTACIÓN: 05 de noviembre 1999



Por la Autoridad del
COMISARIO DE PATENTES Y MARCAS

N. WILLIAMS
Oficial certificador

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REIVINDICACIONES

1. Una dispersión de poliuretano acuoso que comprende:
 - a. una composición de dispersión de poliuretano y
 - b. un medio de espumación preparado al mezclar
 - i. un alcóxilato de siloxano aniónico que tiene la fórmula



en donde $f = 0$ a 1 ;

$g = 1$ a 2 ;



en donde $d = 2$ a 4 ;

$t = 3$ a 12 ;

$w = 0$ a 8 ,

$x = 0$ a 8 , estipulando que cuando

w o $x > 0$, $(t+w+x) = 5$ a 12 ;

R^2 es hidrógeno, acetilo, o un

radical de hidrocarburo que tiene

1 a 4 átomos de carbono; y

R^1 es Q o un alquilo que tiene 1 a 4 átomos de

carbono con

- ii. un cosurfactante orgánico que tiene la fórmula



en donde R^3 es un alquilo, alquenilo, arilo, o

alcarilo que tiene 8 a 16 átomos de carbono;

$a = 2$ a 12 ;

$b = 0$ a 2 ;

$c = 0$ a 2 ; y

R^4 es hidrógeno, acetilo, o un radical

de hidrocarburo que tiene 1 a 4 átomos

de carbono,

con una proporción molar entre $1:19$ a $19:1$.

2. La dispersión de poliuretano acuoso según la

reivindicación 1, caracterizada porque $f = 0$, $g = 1$, $d = 3$, $t = 4$ a 8 , R^1 es metilo, R^2 es alquilo que tiene 8 a 12 átomos de carbono, R^3 es H o Me, R^4 es H, $w = 0$, $x = 0$, $a = 5$ a 8 , $b = 0$, y $c = 0$.

3. La dispersión de poliuretano acuoso según la
5 reivindicación 2, caracterizada porque $t = 7$ a 8 , R^2 es alquilo que tiene 10 a 12 átomos de carbono, y $a = 5$.

4. La dispersión de poliuretano acuoso según la reivindicación 1, caracterizada porque la proporción molar del alcoxilato de siloxano aniónico al cosurfactante orgánico es entre 5:1 a 1:5.

10 5. La dispersión de poliuretano acuoso según la reivindicación 1, caracterizada porque la proporción molar del alcoxilato de siloxano aniónico al cosurfactante orgánico es entre 0.8:1 a 1.2:1.

6. La dispersión de poliuretano acuoso según la reivindicación 1, caracterizada porque el agua es una fase continua.

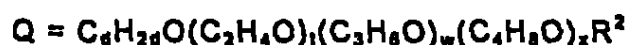
15 7. Una dispersión de poliuretano acuoso que comprende:

- a. una composición de dispersión de poliuretano
- b. un alcoxilato de siloxano aniónico que tiene la fórmula



20 en donde $f = 0$ a 1 ;

$g = 1$ a 2 ;



en donde $d = 2$ a 4 ;

$t = 3$ a 12 ;

25 $w = 0$ a 8 ,

$x = 0$ a 8 , estipulando que cuando

w o $x > 0$, $(t+w+x) = 5$ a 12 ;

R^2 es hidrógeno, acetilo, o un

radical de hidrocarburo que tiene

30 1 a 4 átomos de carbono; y

R^1 es Q o un alquilo que tiene 1 a 4 átomos de carbono; y

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c. un cosurfactante orgánico que tiene la fórmula



en donde R^3 es un alquilo, alquenilo, arilo, o alcarilo que tiene 8 a 16 átomos de carbono;

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$a = 2$ a 12 ;

$b = 0$ a 2 ;

$c = 0$ a 2 ; y

R^4 es hidrógeno, acetilo, o un radical

de hidrocarburo que tiene 1 a 4 átomos

10

de carbono,

con una proporción molar del alcoxilato de siloxano aniónico al surfactante orgánico entre 1:19 a 19:1.

8. La dispersión de poliuretano acuoso según la reivindicación 7, caracterizada porque la composición de dispersión de poliuretano (a) tiene un poliol como un compuesto de hidrógeno activo.

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9. La dispersión de poliuretano acuoso según la reivindicación 8, caracterizada porque $f = 0$, $g = 1$, $d = 3$, $t = 4$ a 8 , R^1 es metilo, R^2 es alquilo que tiene 8 a 10 átomos de carbono, R^3 es H o Me, R^4 es H, $w = 0$, $x = 0$, $a = 5$ a 8 , $b = 0$, y $c = 0$.

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10. La dispersión de poliuretano acuoso según la reivindicación 9, caracterizada porque $t = 7$ a 8 , R^2 es alquilo que tiene 10 a 12 átomos de carbono, y $a = 5$.

11. La dispersión de poliuretano acuoso según la reivindicación 8, caracterizada porque la proporción molar del alcoxilato de siloxano aniónico al cosurfactante orgánico es entre 5:1 a 1:5.

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12. La dispersión de poliuretano acuoso según la reivindicación 8, caracterizada porque la proporción molar para el alcoxilato de siloxano aniónico al cosurfactante orgánico es entre 0.8:1 a 1.2:1.

13. Un método para aplicar una dispersión de poliuretano acuoso a un substrato que comprende:

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a formar una dispersión de poliuretano acuoso al mezclar

- i. una composición de dispersión de poliuretano;
- ii. un alcoxilato de siloxano aniónico que tiene la fórmula



en donde $f = 0$ a 1 ;

$g = 1$ a 2 ;



en donde $d = 2$ a 4 ;

$t = 3$ a 12 ;

$w = 0$ a 8 ,

$x = 0$ a 8 , estipulando que cuando

w o $x > 0$, $(t+w+x) = 5$ a 12 ;

R^2 es hidrógeno, acetilo, o un

radical de hidrocarburo que tiene

1 a 4 átomos de carbono; y

R^1 es Q o un alquilo que tiene 1 a 4 átomos de

carbono; y

- iii. un cosurfactante orgánico que tiene la fórmula



en donde R^3 es un alquilo, alquenilo, arilo, o

alcarilo que tiene 8 a 16 átomos de carbono;

$a = 2$ a 12 ;

$b = 0$ a 2 ;

$c = 0$ a 2 ; y

R^4 es hidrógeno, acetilo, o un radical

de hidrocarburo que tiene 1 a 4 átomos

de carbono,

con una proporción molar del alcoxilato de siloxano

aniónico al surfactante orgánico entre $1:19$ a $19:1$.

- b. espumar la dispersión de poliuretano acuoso; y
- c. aplicar la dispersión de poliuretano acuoso espumosa a un substrato.

14. El método según la reivindicación 13 caracterizado porque el substrato es alfombra.

15. Un alfombra con respaldo de poliuretano preparada de acuerdo a la reivindicación 14.

5 16. La alfombra con respaldo de poliuretano según la reivindicación 15, caracterizada porque la dispersión de poliuretano acuoso espumosa se aplica como una capa de alfombra seleccionada del grupo que consiste de una capa preliminar, una capa laminada, y una capa espumosa.