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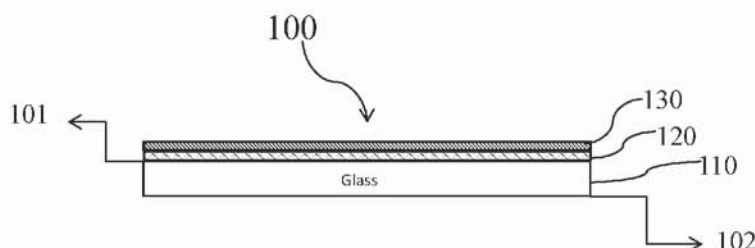
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Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

(54) Title: TEMPORARY PROTECTION FOR HEAT TREATABLE COATED GLASS ARTICLES COMPRISING ACRYLIC MONOMER

**FIG. 1**

(57) Abstract: Temporary protective coating for heat treatable coated glass article comprising acrylic monomers or solid particle reinforced acrylic monomers is disclosed. The temporary protective coating of the present disclosure is completely devoid of oligomeric acrylates. The temporary protective coating is applied directly over a functionally coated transparent substrate to protect the coated substrate during heat treatment and handling of the coated substrate before heat treatment. The temporary protective coating is completely removed during the heat treatment leaving behind no residues thereby keeping the physical properties of the functionally coated substrate intact. A method of making a heat treatable coated article illustrated in FIG. 1 that can be handled before heat treatment is also disclosed.



Published:

- with international search report (Art. 21(3))
- in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE

From the INTERNATIONAL BUREAU

PCTNOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

KUMAR, Giriraj
Saint-Gobain India Pvt. Ltd. (Research &
Development)
Intellectual Property Law Department
No: 1 FA, Phase-II, "C" Block, Kanagam Road,
Tharamani, Chennai-600 113.
INDE

Date of mailing (day/month/year) 27 May 2020 (27.05.2020)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference N2017635	
International application No. PCT/IN2018/050836	International filing date (day/month/year) 13 December 2018 (13.12.2018)

1. The following indications appeared on record concerning:		
☐ the applicant	☒ the inventor	☐ the agent
☐ the common representative		
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2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
☒ the person	☐ the name	☐ the address
☐ the nationality		
☐ the residence		
Name and Address	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	E-mail address ☐ Notifications by e-mail authorized	
3. Further observations, if necessary: The person identified in Box 1 has been deleted from the records.		
4. A copy of this notification has been sent to:		
☐ the receiving Office	☐ the International Preliminary Examining Authority	
☐ the International Searching Authority	☐ the designated Offices concerned	
☐ the Authority(ies) specified for supplementary search	☒ the elected Offices concerned	
	☐ other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Ha Kinam e-mail pct.team1@wipo.int Telephone No. +41 22 338 74 01
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Name and Address SAINT-GOBAIN GLASS FRANCE Saint-Gobain India Pvt. Ltd. (Research & Development) Intellectual Property Law Department No: 1 FA, Phase-II, "C" Block, Kanagam Road, Tharamani, Chennai-600 113. France	State of Nationality FR	State of Residence FR
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2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
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	Facsimile No.	
	E-mail address ☐ Notifications by e-mail authorized	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
☐ the receiving Office	☐ the International Preliminary Examining Authority	
☐ the International Searching Authority	☐ the designated Offices concerned	
☐ the Authority(ies) specified for supplementary search	☒ the elected Offices concerned	
	☐ other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Ha Kinam e-mail pct.team1@wipo.int Telephone No. +41 22 338 74 01
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference N2017635		FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/IN2018/050836	International filing date (day/month/year) 13-12-2018	Priority date (day/month/year) 20-12-2017	
International Patent Classification (IPC) or national classification and IPC C09D133/08 Version=2019.01			
Applicant SAINT-GOBAIN GLASS FRANCE , BANDOPADHYAY, ARKASISH			

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>6</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (sent to the applicant and to the International Bureau) a total of <u>13</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____ containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions). 4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement ☐ Box No. VI Certain documents cited ☐ Box No. VII Certain defects in the international application ☒ Box No. VIII Certain observations on the international application
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Date of submission of the demand 12-04-2019	Date of completion of this report 14-09-2019
Name and mailing address of the IPEA/ Indian Patent Office Plot No. 32, Sector 14, Dwarka, New Delhi-110075 Facsimile No.	Authorized officer Debasish Ghosh Telephone No. +91-1125300200

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/IN2018/050836

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b)).
- ☐ publication of the international application (Rule 12.4(a)).
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a) and (b)).

2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

- ☐ the international application as originally filed/furnished, or
- ☒ the description: pages _____ as originally filed/furnished.
pages* 5-7, 9-12 received by this Authority on 12-04-2019
pages* _____ received by this Authority on _____
- ☒ the claims: Nos. 1-5, 7-10, 13-18, 21, 23, 25 as originally filed/furnished.
Nos.* _____ as amended (together with any statement) under Article 19
Nos.* 6, 11-12, 19-20, 22, received by this Authority on 12-04-2019
- ☐ the drawings: pages _____ as originally filed/furnished.
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____

4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):

- ☒ the description, pages 9-12
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____

5. ☐ This report has been established:

- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
- ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

6. With regard to top-up searches (Rules 66.1ter and 70.2(f)):

- ☐ A top-up search was carried out by this Authority on _____
- ☐ Additional relevant documents have been discovered during the top-up search.
- ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.

7. ☐ Supplementary international search report(s) from Authority(ies) _____ has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/IN2018/050836

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-25</u>	YES
	Claims	_____	NO
Inventive step (IS)	Claims	_____	YES
	Claims	<u>1-25</u>	NO
Industrial applicability (IA)	Claims	<u>1-25</u>	YES
	Claims	_____	NO

2. Citations and explanations (Rule 70.7)

The amended documents filed by the applicant under Article 34 via demand for International Preliminary Examination dated 12.04.2019 have been duly considered. However, the reply is not found persuasive in view of the observations communicated via the Written Opinion dated 24.01.2019.

The amendments made in the instant claims 6, 12, 19-20, 22, 24 bring clarity. The amendment done in claim 11 is supported by the description. Further, the amendments carried out in pages 5 and 6 of the description also bring clarity. Hence, the said amendments are allowed in accordance with the PCT Article 34(2) (b).

The amendments made in the instant pages 9-12 of the description fall beyond the scope of the disclosure as filed. Hence, the said amendments are not allowed in accordance with the PCT Article 34(2) (b).

Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure:

D1: US 2016194516 A1 (SAINT GOBAIN[FR]) 7 July 2016 (07-07-2016)

D2: US 2009044897 A1 (GUARDIAN INDUSTRIES[US]) 19 December 2009 (19-12-2009)

The subject-matter of the present application reveals the temporary protective coating wherein the temporary protective coating comprising acrylic monomers which protects the functional coating during heat treatment wherein the heat treatment involves heating to a temperature ranging above 550 °C and below 800 °C.

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The range of the acrylic monomer present within the protective coating provided in the claims 7 & 8 is conflicting in nature as the range mentioned in the claim 8 is having a broader scope than the range disclosed in the claim 7.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Continuation of Citation and Explanation (Box5)

D1 reveals an article comprising a substrate comprising two main faces defining two main surfaces separated by edges wherein the said substrate bearing a temporary protective layer having thickness of at least 1 micrometer which is not soluble in water, deposited on at least one portion of the functional coating wherein the functional coating comprises a thin-film multilayer & the upper layer is selected from a layer of inorganic oxides (abstract, claims-1, 4, 6). D1 further reveals the said layer is obtained from a composition comprising (meth)acrylate compounds selected from monomers wherein the monomers are selected from such as trimethylolpropane trimethacrylate, trimethylolpropane triacrylate, penta-erythritol triacrylate (page-3-4, para-0072, claim-8).

D2 reveals temporary protective coating wherein the protective layer comprises acrylic polymer wherein the thermal tempering typically involves the heat treatment of a coated glass substrate using furnace temperature(s) of at least 580 °C-700 °C (abstract, page-3, paras-0033-0036).

Novelty:

None of the cited prior art documents alone reveal the exact coating composition for the temporary protective layer & temperature range around which the protection will be stable. Therefore, the subject-matter of the claims 1-25 is novel over the cited documents in the sense of PCT Article 33(2).

Inventive step:

D1 is considered to be the closest prior art document. The formation of the temporary protective layer by using acrylic monomer is disclosed in D1. But, the temperature range through which the protection will be stable is not inherently present within D1. The preparation of a similar type of temporary protective layer by using acrylic solution is also disclosed in D2. The temperature factor which is the missing characteristics in D1 is present in D2 as mentioned above. Further, the applicant has not provided any argumentation regarding the issue of inventive step. Therefore, a person skilled in the art using the technology of D1 & knowledge of D2 would arrive at the present application. Therefore inventive step cannot be acknowledged for the claims 1-25 in the sense of PCT Article 33(3).

Industrial applicability:

The subject-matter of claims 1-25 can find industrial applicability

such as in the technical field of the glass industry,
and thus meet the requirements of PCT Article 33(4).

Claims

We claim,

- 1) A heat treatable coated article comprising:
 - a transparent substrate having a first surface;
 - a functional coating deposited over at least a portion of the first surface;
 - a temporary protective coating deposited over at least a portion of the functional coating;wherein the temporary protective coating comprising acrylic monomers protects the functional coating during heat treatment and handling of the heat treatable coated article before heat treatment.
- 2) The heat treatable coated article as claimed in claim 1, wherein the temporary protective coating comprises solid particle reinforced acrylic monomers.
- 3) The heat treatable coated article as claimed in claim 1, wherein the functional coating consists of single layer or multilayer coating comprising one or more metals, non-metals, alloys, composites, compounds or their derivatives or combinations thereof.
- 4) The heat treatable coated article as claimed in claim 1, wherein the functional coating may be selected from the group consisting of magnetron deposited coatings, sputter deposited coating or chemical vapor deposited coatings.
- 5) The heat treatable coated article as claimed in claim 1, wherein the functional coating comprises of low emissivity coatings, solar energy reflective or absorptive coatings, thermal infrared reflective or absorptive coatings or their combinations thereof.

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- 6) The heat treatable coated article as claimed in claim 1 or claim 2, wherein the temporary protective coating comprises of acrylic monomers selected from the group consisting of trimethylol propane tri acrylate (TMPTA), hexanediol diacrylate (HDDA), tricyclodecane dimethanol diacrylate (TCDDA), ethoxylated(3) trimethylolpropane triacrylate, isobornyl acrylate, tripropylene glycol diacrylate (TPGDA), stearyl acrylate, octadecyl acrylate, penta erythrol tri and tetra acrylate (PETA), tripropyleneglycol monomethyl ether acrylate (TPGMEME) or their combinations thereof.
- 7) The heat treatable coated article as claimed in claim 1, wherein the temporary protective coating comprises of acrylic monomers ranging between 80 % and 96 %.
- 8) The heat treatable coated article as claimed in claim 2, wherein the temporary protective coating comprises of acrylic monomers ranging between 30 % and 90 %.
- 9) The heat treatable coated article as claimed in claim 1 or claim 2, wherein the temporary protective coating has a thickness ranging between 5 microns and 100 microns.
- 10) The heat treatable coated article as claimed in claim 1 or claim 2, wherein the temporary protective coating is substantially a continuous or a non-continuous coating that is devoid of any oligomeric acrylates.
- 11) The heat treatable coated article as claimed in claim 1 or claim 2, wherein the temporary protective coating includes additives selected from the group consisting of adhesion promoters or photo initiators, wherein the adhesion promoter is phosphate methacrylate or modified acidic

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methacrylate and photo initiator is benzophenone or hydroxycyclohexylphenylketone.

- 12) The heat treatable coated article as claimed in claim 2, wherein the solid particle is selected from the group consisting of polymeric micro beads, glass bubble, glass flakes, glass fibers or their combinations thereof.
- 13) The heat treatable coated article as claimed in claim 2, wherein the size of the solid particle ranges between 5 and 100 microns.
- 14) The heat treatable coated article as claimed in claim 1, wherein the transparent substrate may be a flat glass or a curved glass.
- 15) The heat treatable coated article as claimed in claim 1, wherein the transparent substrate is selected from the group consisting of non-tempered glass, annealed glass or strengthened glass.
- 16) The heat treatable coated article as claimed in claim 1, wherein handling of the heat treatable coated article includes cutting, edge grinding, beveling, drilling, sizing, finishing, storing and transporting of the heat treatable coated article.
- 17) The heat treatable coated article as claimed in claim 1 or claim 2, wherein the temporary protective coating is completely removed during the heat treatment.
- 18) The heat treatable coated article as claimed in claim 1, wherein the heat treatment involves heating to a temperature ranging above 550 °C and below 800 °C.

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- 19) A coating composition for forming a temporary protective coating over a heat treatable coated article as claimed in claim 1 having a functional coating, wherein the coating comprises:

acrylic monomers selected from the group consisting of trimethylol propane tri acrylate (TMPTA), hexanediol diacrylate (HDDA), tricyclodecane dimethanol diacrylate (TCDDA), ethoxylated(3) trimethylolpropane triacrylate, isobornyl acrylate, tripropylene glycol diacrylate (TPGDA), stearyl acrylate, octadecyl acrylate, penta erythrol tri and tetra acrylate (PETA), tripropyleneglycol monomethyl ether acrylate (TPGMEMA) or their combinations thereof, wherein the temporary protective coating is devoid of any oligomeric acrylates.

- 20) A coating composition for forming a temporary protective coating over a heat treatable coated article as claimed in claim 2 having a functional coating, wherein the coating comprises:

solid particle reinforced acrylic monomers wherein the acrylic monomers selected from the group consisting of trimethylol propane tri acrylate (TMPTA), hexanediol diacrylate (HDDA), tricyclodecane dimethanol diacrylate (TCDDA), ethoxylated(3) trimethylolpropane triacrylate, isobornyl acrylate, tripropylene glycol diacrylate (TPGDA), stearyl acrylate, octadecyl acrylate, penta erythrol tri and tetra acrylate (PETA), tripropyleneglycol monomethyl ether acrylate (TPGMEMA) or their combination thereof, and the solid particle is selected from the group consisting of polymeric micro beads, solid acrylic copolymers, glass bubble, glass flakes, or their combinations thereof and wherein the temporary protective coating is devoid of any oligomeric acrylates

- 21) The coating composition as claimed in claim 19 or claim 20 comprises of additives selected from the group consisting of adhesion promoters, photo initiators or surfactants.

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22) A method of protecting a coated article during heat treatment and handling of the coated article before heat treatment, comprising the steps of:

providing a transparent substrate having a first surface provided with a functional coating over at least a portion of the first surface;
providing a temporary protecting coating composition as claimed in claim 19 or claim 20 over at least a portion of the functional coating;
curing the coated substrate;
handling the coated substrate; and
heating the coated substrate for removing the temporary protective coating, wherein the temperature ranges above 550 °C and below 800 °C.

23) The method as claimed in claim 22, wherein the solid particles present in the temporary protective coating act as spacers and rolling objects that protects the functional coating of the heat treatable coated article from mechanical and chemical damages during heat treatment and handling.

24) A method of making a heat treatable coated article that can be handled before heat treatment, comprising the steps of:

providing a transparent substrate;
depositing a functional coating on one surface of the substrate;
curing or drying the substrate coated with the functional coating;
providing a temporary protective coating composition as claimed in claim 19 or claim 20 over the functional coating; and
UV curing the substrate coated with the temporary protective coating.

25) The method as claimed in claim 24 further involves handling the substrate coated with the temporary protective coating and heat treating the handled

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substrate to a temperature ranging above 600 °C and below 800 °C to completely remove the temporary protective coating.

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FIG. 3 illustrates a solid particle reinforced polymers, according to one embodiment of the present disclosure.

Skilled artisans appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of embodiments of the invention.

Detailed Description

Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or similar parts. Embodiments disclosed herein are related to heat treatable coated article provided with a temporary protective coating.

A heat treatable coated article 100 according to one embodiment of the present disclosure is illustrated in FIG. 1. The heat treatable coated article 100 comprises of a transparent substrate 110 having a first surface 101 and a second surface 102. The first surface 101 of the transparent substrate 110 is provided with a functional coating 120. Directly provided over the functional coating 120 is a temporary protective coating 130 that protects the functional coating 120 from chemical, mechanical and weathering damages. The temporary protective coating 130 protects the functional coating 120 during heat treatment of the heat treatable coated article 100 and handling of the heat treatable coated article 100 before heat treatment.

In one embodiment of the present disclosure, the temporary protective coating 130 comprises of acrylic monomers. In another embodiment of the present disclosure, the temporary protective coating 130 comprises solid particle reinforced acrylic monomers. In all embodiment of the present disclosure, the temporary protective coating 130 is completely devoid of any acrylic oligomers. In one aspect of the embodiment, the acrylic monomers are selected from the group consisting of trimethylol propane tri acrylate (TMPTA), hexanediol diacrylate (HDDA), tricyclodecane dimethanol diacrylate (TCDDA), ethoxylated(3) trimethylolpropane triacrylate, isobornyl acrylate, tripropylene

glycol diacrylate (TPGDA), stearyl acrylate, octadecyl acrylate, penta erythrol tri and tetra acrylate (PETA), tripropylenglycol monomethyl ether acrylate (TPGMEMA) or their combinations thereof.

5 Acrylic monomers present in the temporary protective coating 130 in the embodiment comprising acrylic monomers ranges between 80 % and 96 %. Acrylic monomers present in the temporary protective coating 130 in the embodiment comprising solid particle reinforced acrylic monomers ranges between 30 % and 90 %. The thickness of the temporary protective coating 130 ranges between 5 microns and 100 microns. In multiple embodiments, the
10 temporary protective coating 130 is substantially a continuous or a non-continuous coating that is devoid of any oligomeric acrylates.

In another aspect of the embodiment, the solid particle is selected from the group consisting of polymeric micro beads, solid acrylic copolymers, glass bubble, glass flakes, glass fibers or their combinations thereof. The size of
15 the solid particles ranges between 5 and 100 microns. In yet another aspect of the embodiment, the temporary protective coating 130 comprises additives selected from the group consisting of adhesion promoters, photo initiators etc. In one embodiment, the adhesion promoter is selected from the group consisting of phosphate methacrylate or modified acidic methacrylate. In another embodiment,
20 the photo initiator is benzophenone and/or hydroxycyclohexylphenylketone.

In one embodiment, the functional coating 120 provided on the first surface 101 of the transparent substrate 100 may be a single layer or multilayer coating comprising one or more metals, non-metals, alloys, composites, compounds or their derivatives or combinations thereof. In another
25 embodiment, the functional coating 120 may be provided by a method selected from the group consisting of magnetron deposited coatings, sputter deposited coating or chemical vapor deposited coatings. In one other embodiment, the functional coating 120 may be low emissivity coatings, solar energy reflective or absorptive coatings, thermal infrared reflective or absorptive coatings or their
30 combinations thereof.

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In one embodiment, the transparent substrate 110 may be a flat glass or a curved glass selected from the group consisting of non-tempered glass, annealed glass or strengthened glass. In yet another embodiment, the transparent substrate 110 may be a clear glass or a tinted glass. The heat treatable coated article 100 can be heated to a temperature above 550 °C and below 800 °C without damaging the functional coating 120 due to the presence of the temporary protective coating 130. During heat treatment of the heat treatable coated article 100 the temporary protective coating 130 is completely removed without leaving behind any residue on the functional coating 120 thereby keeping the physical and optical properties of the heat treated coated article unaltered.

In another embodiment of the present disclosure the heat treatable coated article 100 comprising the temporary protective coating 130 can also be handled before heat treatment. Handling of the heat treatable coated article 100 involves post-processing procedures not limiting to cutting, edge grinding, beveling, drilling, sizing, finishing, storing and transporting. Thus handling and heat treatment of the heat treatable coated article 100 neither affects its physical properties nor result in any damage to the functional coating 120.

Example 1

Preparation of Temporary Protective Coating Composition

The components of temporary protective compositions A to composition O as shown in table 1 were added in a glass beaker at specified concentrations and mixed thoroughly using a magnetic stirrer until the photo initiator was completely dissolved in each of the compositions. The contents of all compositions were then allowed to stay for a period of 30 minutes to ensure absence of bubbles. The composition A to composition I were then applied on functionally coated glass substrates using a Meyer rod at thicknesses ranging between 5 µm and 20 µm. The functionally coated glass substrates were then cured in a UV curing chamber for at least about 10 seconds. The adhesion promoter used in the below compositions is SR 9051 and Iracure 184 was used as the photo initiator.

Table 1: Temporary Protective Coating Composition

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H	PMMA beads (20 μ)	15
	TMPTA	57
	Stearyl acrylate	20
	Adhesion promoter	0.20
	Photo initiator	7.80
I	PMMA beads 20 μ	15
	TMPTA	54
	Tris(2-hydroxy Ethyl)isocyanurate Triacrylate(THEICTA)	23
	Adhesion promoter	0.20
	Photo initiator	7.80
J	Penta erythrol tri and tetra acrylate (PETA)	20
	TMPTA	56
	PMMA beads	16
	Adhesion promoter	0.50
	Photo initiator	7.50
K	Tripropylene glycol diacrylate (TPGDA)	30
	TMPTA	38
	PMMA beads	16
	Adhesion promoter	0.50
	Photo initiator	7.50
L	TMPTA	60
	Isobornyl acrylate (IBOA)	17
	PMMA beads	15
	Adhesion promoter	0.50
	Photo initiator	7.50
M	Glass flakes GF001/10	15
	TMPTA	77
	Adhesion promoter	0.20

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	Photo initiator	7.80
N	PMMA beads	15
	Tripropyleneglycol monomethyl ether acrylate (TPGMEEMA)	57
	TMPTA	20
	Adhesion promoter	0.20
	Photo initiator	7.80
O	Micro beads (10 μ)	12
	Hexanediol diacrylate (HDDA)	80
	Adhesion promoter	0.20
	Photo initiator	7.80

Example 2

Durability Studies

The following durability studies were performed on the functionally coated glass substrates provided with the temporary protective compositions of the present disclosure A, B, C, G, H, I, J, K, L, M, N and O.

5 Erichsen Scratch Test (EST):

3-100 mm x 100 mm samples were rotated in a circular manner on the machine using a sc indenter. It was observed that no scratch could be seen on the functional coating up to 6N for all above coating. Temporary protective compositions A, C, G, H and I were observed to show scratch resistance up to 8N. EST was done minimum 120 minutes after the curing.

10 Erichsen Scratch Test Then Tempering (ESTTT):

The above tested samples were then subjected to the tempering process (samples were kept in a Nabertherm Tempering furnace) at 690 °C for 8 minutes to remove the temporary protective layer. It was observed that no residue or corrosion could be seen on the coated glass substrates indicating that the temporary protective layer had been completely removed. No scratches up to 8 N could be seen based on the Erichsen scratch test conducted.

15 Erichsen Brush Test (EBT):

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Samples coated with the temporary protective layer were subjected to a brush test in water. This test was conducted to understand and check the adhesion of the temporary protective layer to the coated glass substrates which would be critical during the washing step during processing. All the above mentioned samples showed no delamination of the temporary protective layer after the conclusion of the test.

Abrasion Test:

Using a CS-10F wheel on a taber abrasion machine 2 samples provided with composition A were rotated in a circular manner for 500 cycles. Initial weights and final weights were considered and no significant weight loss was observed. Results of the durability studies are summarized in table 2.

Table 2: Results of Durability Tests

Composition	EST	EBT	ESTTT
A	Pass @ 8N	No pinholes, scratches or delamination observed	Pass @ 8N
B	Pass @ 6N	No pinholes, scratches or delamination observed	Pass @ 6N
C	Pass @ 8N	No pinholes, scratches or delamination observed	Pass @ 8N
G	Pass @ 8N	No pinholes, scratches or delamination observed	Pass @ 8N
H	Pass @ 8N	No pinholes, scratches or delamination observed	Pass @ 8N
I	Pass @ 8N	No pinholes, scratches or delamination observed	Pass @ 8N
J	Pass @ 6N	No pinholes, scratches or delamination observed	Pass @ 6N
K	Pass @ 6N	No pinholes, scratches or delamination observed	Pass @ 6N
L	Pass @ 5N	No pinholes, scratches or delamination observed	Pass @ 5N

M	Pass @ 5N	No pinholes, scratches or delamination observed	Pass @ 5N
N	Pass @ 5N	No pinholes, scratches or delamination observed	Pass @ 5N
O	Pass @ 6N	No pinholes, scratches or delamination observed	Pass @ 6N

CASS & SO₂ Testing:

Samples coated with the temporary protective layer were subjected to different climatic chambers. The climatic chambers were set at conditions that mimic harsh weather conditions. The size of the samples (200 x 200 mm) were chosen in order to maximize visibility of the corrosion. The samples were observed for corrosion after 1, 2 and 4 days. The tested samples were then tempered on the furnace at 690 °C for 9 minutes. It was observed that the samples coated with the temporary protective layer of the present disclosure did not show any signs of corrosion both during the CASS and SO₂ testing as well after the tempering process.

Industrial Applicability

The heat treatable coated article 100 of the present disclosure can be transported to a distant location and be processed before being heat treated to obtain a heat treated coated article. Hence heat treatable coated article 100 of the present disclosure has the advantage of being able to be manufactured and coated in one location, transported without any mechanical or chemical damages to multiple processor locations for various post-processing procedures and finally to a fabricator location for heat treatment and use. The temporary protective coating is completely removed during the heat treatment of the heat treatable coated article 100 without leaving behind any residue deposition. This helps in retaining the optical and performance properties of the functionally coated glass.

The solid particles present in the temporary protective coating act as spacer or rolling objects and protect the functional coated glass substrates from damage during transport. The effect of solid particles during transport is depicted

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