PROTECTED SUBSTRATE AND METHOD FOR PROTECTING A SUBSTRATE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of United States Application No. 17/214,905, filed April 27, 2021, which claims the benefit of United States Provisional Patent Application No. 63/018,596, filed May 1, 2020, which are hereby incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention is directed to protected substrates and to methods for protecting a substrate.

Description of Related Art

[0003] Large substrates, such as large glass sheets, often become damaged during shipment from the manufacturing plant to the customer site. This results in a substrate unsuitable for installation, causing chargebacks to the manufacturer and delay to the construction project. One way to protect large substrates from damage is to overlap, or hold together using tape, two smaller protective sheets positioned over the large substrates.

[0004] This approach includes certain drawbacks. For example, a small capillary tube can be formed at the seam of the two smaller protective sheets over which the tape is applied. The small capillary tube attracts water that induces corrosion at the site of the seam, which results in damage requiring chargebacks and project delays. Therefore, a protected substrate that prevents damage to a large substrate during shipment, including corrosion damage induced at the seam of overlaying protective sheets, is desired.

SUMMARY ~~OF THE INVENTION~~

[0005] ~~The~~ In one aspect, the present ~~invention~~disclosure is directed to a protected substrate ~~including~~comprising: a planar substrate ~~including~~ comprising a surface; and a burn-off temporary protective layer positioned over at least a portion of the surface, where the burn-off temporary protective layer comprises a polyurethane layer, an epoxide layer, or a combination thereof. The burn-off temporary protective layer may be removable by a heat treatment process that does not substantially damage the surface.

[0006] ~~The~~ In another aspect, the present ~~invention~~disclosure is also directed to a method for protecting a substrate, ~~including~~comprising: providing a planar substrate ~~including~~ comprising a surface; and applying a material to form a burn-off temporary protective layer over at least a first portion of the surface, where the burn-off temporary protective layer comprises a polyurethane layer, an epoxide layer, or a

combination thereof. The burn-off temporary protective layer may be removable by a heat treatment process that does not substantially damage the surface.

[0007] The present ~~invention~~disclosure is also directed to a method of removing a burn-off temporary protective layer from a coated substrate including: providing a coated substrate including a surface over a portion of which a burn-off temporary protective layer is applied, where the burn-off temporary protective layer comprises a polyurethane layer, an epoxide layer, or a combination thereof; and removing the burn-off temporary protective layer from the surface by burning the burn-off temporary protective layer to form an unprotected substrate. The burn-off temporary protective layer may be removable by a heat treatment process that does not substantially damage the surface. In another aspect, the present disclosure is also directed to a method of removing a burn-off temporary protective layer from a coated substrate, comprising: providing a coated substrate comprising a surface over a portion of which a burn-off temporary protective layer is applied, wherein the burn-off temporary protective layer comprises a polyurethane layer, an epoxide layer, or a combination thereof; and removing the burn-off temporary protective layer from the surface by burning the burn-off temporary protective layer to form an unprotected substrate without substantially damaging the surface.

[0008] The present ~~invention~~disclosure is also directed to a protected substrate, including: a planar substrate including a surface; a temporary protective layer positioned over at least a portion of the surface; a first temporary protective sheet positioned over at least a first portion of the surface; and a second temporary protective sheet positioned over at least a second portion the surface, where an overlapping portion of the second temporary protective sheet overlaps an overlapping portion of the first temporary protective sheet at an overlap; where a gap is defined by the overlap between the second temporary protective sheet and a portion of the surface, where a portion of the temporary protective layer is positioned between the second temporary protective sheet and the portion of the surface.

[0009] The present ~~invention~~disclosure is also directed to a protected substrate including: a planar substrate including a surface; a first temporary protective sheet positioned over a first portion of the surface; a second temporary protective sheet positioned over a second portion of the surface, where a third portion of the surface is not covered by the first temporary protective sheet and where the third portion of the surface is not covered by the second temporary protective sheet; and a temporary protective layer over at least the third portion of the surface,

where the temporary protective layer is positioned directly beneath the first and/or second protective sheet and is positioned between the substrate and the first and/or second temporary protective sheet.

[0010] The present ~~invention~~disclosure is also directed to a method for protecting a substrate including: providing a planar substrate including a surface; applying a material to form a temporary protective layer over at least a first portion of the surface; adhering a first temporary protective sheet over a second portion of the surface, where a portion of the first temporary protective sheet overlaps a first portion of the temporary protective layer; and adhering a second temporary protective sheet over a second portion of the temporary protective layer and over a

third portion of the surface, where an overlap is formed between the first temporary protective sheet and the second temporary protective sheet, and where a gap is defined by the overlap between the second temporary protective sheet and the surface.

[0011] The present ~~invention~~disclosure is also directed to a method of removing a temporary protective layer from a coated substrate including: providing a protected substrate including: a planar substrate including a surface; a temporary protective layer positioned over at least a portion of the surface; a first temporary protective sheet positioned over at least a first portion of the surface; and a second temporary protective sheet positioned over at least a second portion the surface, where an overlapping portion of the second temporary protective sheet overlaps an overlapping portion of the first temporary protective sheet at an overlap; where a gap is defined by the overlap between the second temporary protective sheet and a portion of the surface, where a portion of the temporary protective layer is positioned between the second temporary protective sheet and the portion of the surface; removing the first temporary protective sheet and/or the temporary protective sheet by peeling; and removing the temporary protective layer from the surface by burning, vaporizing, removing using a solvent, or peeling the temporary protective layer to form an unprotected substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 shows a protected substrate according to a first non-limiting embodiment;

[0013] FIG. 2 shows a protected substrate according to a second non-limiting embodiment;

[0014] FIG. 3 shows a protected substrate according to a third non-limiting embodiment;

[0015] FIG. 4 shows a protected substrate according to a fourth non-limiting embodiment;

[0016] FIG. 5 shows a protected substrate according to a fifth non-limiting embodiment;

[0017] FIG. 6 shows a protected substrate according to a sixth non-limiting embodiment;

[0018] FIG. 7 shows a protected substrate according to a seventh non-limiting embodiment;

[0019] FIG. 8 shows a protected substrate according to an eighth non-limiting embodiment;

[0020] FIG. 9 shows a protected substrate according to a ninth non-limiting embodiment;

[0021] FIG. 10 shows a protected substrate according to a tenth non-limiting embodiment; and

[0022] FIG. 11 shows a protected substrate according to an eleventh non-limiting embodiment.

DESCRIPTION OF THE INVENTION