Claims

We Claim:

1) A heat treatable decorative article comprising:

a glass substrate;

a decorative pattern layer comprising an enamel comprising an inorganic oxides material, a resin and glass frits; and

a protective layer comprising an inorganic oxide material, a resin and glass frits, wherein the decorative pattern layer is applied directly on at least one or both surface of the glass substrate and the protective layer is disposed above the decorative pattern layer,

wherein the decorative pattern layer covers 5% to 90% of the total surface area of the glass substrate.

2) The heat treatable decorative article as claimed in claim 1, wherein the glass substrate comprises of a clear, a extra clear or a tinted substrate or a frosted substrate or a patterned substrate or a functionally coated substrate.

3) The heat treatable decorative article as claimed in claim 2, wherein the functionally coated glass substrate comprises:

a functional layer comprising at least one of metals or metal alloys selected from a group consisting of niobium, silver, chromium, nickel, tantalum, zirconium, titanium, or combination thereof and at least one over-layer applied directly over the functional layer.

4) The heat treatable decorative article as claimed in claim 3, wherein the over-layer comprises at least one metal oxide or metal nitride selected from a group consisting of Sn, Ti, Ta, Zn, Si or combination thereof.

5) The heat treatable decorative article as claimed in claim 1, wherein the decorative pattern layer comprises not more than 40 % of inorganic oxide material, not more than 20 % of the resin and not more than 85 % of glass frits.

6) The heat treatable decorative article as claimed in claim 1, wherein the protective layer comprises not more than 40 % of inorganic oxide material, not more than 40 % of the resin and not more than 85 % of glass frits.

7) The heat treatable decorative article as claimed in claim 1, wherein the decorative pattern layer upon drying has a weight percentage of an organic material in the range of 5-75% of the total weight of the decorative pattern layer.

8) The heat treatable decorative article as claimed in claim 1, wherein the decorative pattern layer is applied on the glass substrate using one or more methods involving screen printing, roller coating, curtain coating, digital printing, masking and spray painting, spray coating, or combinations thereof.

9) The heat treatable decorative article as claimed in claim 1, wherein the decorative pattern layer comprises of a smooth transparent finish, a matte finish, a semi-transparent finish, a full coverage, an opaque, finish or combinations thereof.

10) The heat treatable decorative article as claimed in claim 1, wherein the protective layer upon drying has a weight percentage of an organic material is in a range of 5-40% of the total weight of the protective layer.

11) The heat treatable decorative article as claimed in claim 7 or as claimed in 10, wherein the organic material comprises at least one or more materials selected from the group consisting of polyols, alkyds, acrylic, polyacrylic, polyacrylates, polymethacrylates, acrylamides, melamine, polycarbonates, acrylic-styrenes, vinyl- acrylic, urethanes, polyurethanes, polyesters, polyolefines, urethane alkyds, polyurea, amino resins, polyamides, epoxies, epoxy esters, phenolic resins, silicon resins, PVC, PVB, water-based resins and reaction products of photocurable chemicals.

12) The heat treatable decorative article as claimed in claim 1, wherein a thickness of the decorative pattern layer and the protective layer ranges from 0.1 to 150 microns.

13) The heat treatable decorative article as claimed in claim 1, exhibits scratch resistance on the coated side having the decorative pattern layer, wherein the scratch resistance is determined upon subjecting the glass to a Scelerometer by applying a predetermined weight.

14) The heat treatable decorative article as claimed in claim 1, exhibits resistance to friction on the coated side having the decorative pattern layer for about 1000 cycles, wherein the resistance to friction is determined by a brush test.

15) The heat treatable decorative article as claimed in claim 1 can be heat treated to a temperature above 600 °C after handling to obtain a heat-treated decorative glass article.

16) The heat treatable decorative article as claimed in claim 1 or claim 14 wherein handling includes cutting, edge grinding, beveling, drilling, sizing, finishing and transporting of the heat treatable decorative glass article.

17) A heat treatable decorative article comprising:

a glass substrate; and

one or more protective layers as claimed in claim 1, wherein the one or more protective layers are applied directly on at least one or both surface of the glass substrate and wherein the one or more protective layers covers at least 5% to 90% of the total surface area of the glass substrate.

18) The heat treatable decorative article as claimed in claim 1 and claim 15, wherein the heat treatment involves heating to a temperature above 600 °C.

19) A method of making a heat treatable decorative article, the method comprises the steps of:

pre-treatment of a substrate;

providing a decorative pattern layer on at least one or both surface of the substrate;

wherein the decorative pattern layer covers 5% to 90% of the total surface area of the glass substrate,

curing the decorative pattern layer at a temperature ranging between 120 ºC to 180 °C for a period not more than 20 minutes;

disposing a protective layer over the decorative pattern layer; and

curing the protective layer at a temperature ranging between 150 ºC to 200 °C for a period not more than 20 minutes.