SUMMARY

[0006] In one aspect, a glass article is disclosed comprising a glass having a composition comprising in mole percent on an oxide basis:

SiO_2	61 – 74;
Al_2O_3	9 – 14;
B_2O_3	0 – 12;
MgO	0 – 9;
CaO	3.5 – 12;
SrO	0 – 5;
BaO	0 – 5;
SnO_2	0 – 0.15;
NiO	0.025 – 0.13;
Co_3O_4	0.005 – 0.04; and

wherein $(MgO+CaO+SrO+BaO)/Al_2O_3$ is equal to or greater than 1, and an average optical transmittance of the glass article over a wavelength range from 450 nm to 650 nm for a thickness of 0.7 mm is less than 90%. The glass may be an alkali free glass.

[0007] In one example, the average optical transmittance of the glass article as described above may be in a range from about 60% to about 82%. An optical transmittance of the glass article over the wavelength range from 450 nm to 650 nm for a thickness of 0.7 mm may be equal to or less than about +/- 5%.

[0008] In another example, an anneal point of the glass as described above may be greater than about 700°C.

[0009] In another example, the anneal point as described above may be in a range from about 710°C to about 810°C.

[0010] In another example, a liquidus temperature of the glass as described above may be greater than about 1000°C.

[0011] In another example, the liquidus temperature as described above may be in a range from about 1000°C to about 1300°C.

[0012] In another example, a coefficient of thermal expansion of the glass article as described above may be in a range from about $29x10^{-7}$ to about $40x10^{-7}$ over a temperature range of 0°C to 300°C.

[0013] In another example, a density of the glass article as described above may be equal to or less than about 2.65 g/cc^3.

[0014] In another example, the glass as described above may comprise B_2O_3 in an amount in a range from about 0.2 mol% to about 12 mol%.

[0015] In another example, the glass as described above may comprise MgO in an amount in a range from about 0.9 mol% to about 8 mol%.

[0016] In another example, the glass as described above may comprise:

SiO_2	67 – 74;
Al_2O_3	10 – 14;
B_2O_3	0 – 3;
MgO	3 – 8;
CaO	3.9 – 8;
SrO	0 – 2; and
BaO	2 – 5.

[0017] In another example, the glass as described above may comprise:

SiO_2	68 – 74;
B_2O_3	0.2 – 2;
MgO	3.5 – 8;
CaO	3.9 – 6;
SrO	1 – 1.6; and
BaO	3 – 5.

[0018] In another example, the anneal point as described above may be greater than about 800°C.

[0019] In another example, a coefficient of thermal expansion of the glass article as described above may be in a range from about $34x10^{-7}$ to about $40x10^{-7}$ over a temperature range of 0°C to 300°C.

[0020] In another example, a liquidus temperature of the glass as described above may be greater than about 1100°C.

[0021] In another example, the glass as described above may comprise:

SiO_2	64 – 71;
Al_2O_3	9 – 12;
B_2O_3	7 – 12;

MgO 0.9 – 3;

CaO 6 – 12;

SrO 0 – 2; and

BaO 0 – 1.

[0022] In another example, the glass as described above may comprise:

SiO_2 66 – 71;

MgO 0.9 – 2;

CaO 7 – 11.5;

SrO 0.5 – 1.5; and

BaO 0 – 0.1.

[0023] In another example, the glass as described above may comprise:

SiO_2 61 – 69;

Al_2O_3 11 – 14;

B_2O_3 5 – 9;

MgO 2 – 9;

CaO 3 – 9; and

SrO 1 – 5.

[0024] In another example, the glass as described above may comprise:

SiO_2 64 – 69;

B_2O_3 6 – 9;

MgO 3 – 6;

CaO 5 – 7; and

SrO 3 – 5.

[0025] In another example, the glass as described above may comprise:

SiO_2 66 – 71;

Al_2O_3 11 – 14;

B_2O_3 3 – 6;

MgO 3 – 6;

CaO 4 – 7;

SrO 1 – 5; and

BaO 0 – 2.

[0026] In another example, a coefficient of thermal expansion of the glass article as described above may be in a range from about $33x10^{-7}$ to about $40x10^{-7}$ over a temperature range of 0°C to 300°C.

[0027] In another example, a liquidus temperature of the glass as described above may be greater than about 1100°C.

[0028] In another example, the glass as described above may comprise:

SiO_2	66 – 69;
Al_2O_3	12 – 14;
B_2O_3	4 – 5;
MgO	4 – 6;
CaO	5 – 7; and
SrO	1 – 4.

[0029] In another example, the glass as described above may comprise:

NiO	0.055 – 0.065; and
Co_3O_4	0.011 – 0.013.

[0030] In another example, the glass as described above may comprise:

NiO	0.077 – 0.128; and
Co_3O_4	0.025 – 0.037.

[0031] In another aspect, a display device is disclosed, comprising a plurality of display substrates arranged on a base plate comprising the glass as described herein, each display substrate comprising a plurality of light emitters disposed thereon and configured to direct light through the base plate.

[0032] In another example, each display substrate may comprise a barrier layer comprising at least one of silica or silicon nitride deposited on the display substrate between the glass and the plurality of light emitters.

[0033] In another example, a display device is disclosed, comprising a display substrate comprising a plurality of light emitters disposed thereon, an optically clear adhesive layer disposed over the plurality of light emitters on the display substrate, and a glass cover plate disposed over the OCA layer, the glass cover plate comprising the glass as described herein.

[0034] In another example, the display substrate may comprise the glass as described herein.

[0035] In another example, the display substrate as described above may comprise a barrier layer comprising at least one of silica or silicon nitride deposited on the display substrate between the glass and the plurality of light emitters.

[0036] In another example, the display device as described above may comprise a top emission display device and the plurality of light emitters are configured to direct light through the glass cover plate.

[0037] The disclosure is additionally directed to an object comprising the glass produced by a downdraw sheet fabrication process. The disclosure is further directed to glass produced by the fusion process or variants thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] The accompanying figures, which are incorporated in and constitute a part of this specification, illustrate several embodiments described below.

[0039] FIG. 1 is a top view of an exemplary bottom emission display device comprising a plurality of display tiles arranged in rows and columns;

[0040] FIG. 2 is a cross-section of a portion of the display device of FIG. 1;

[0041] FIG. 3 is a close-up cross-sectional view of a portion of the display device of FIG. 2;

[0042] FIG. 4 is a schematic view of a forming body used to make precision sheet in a fusion down draw process;

[0043] FIG. 5 is a cross-sectional view of the forming body of FIG. 4; and

[0044] FIG. 6 is a plot of percent transmittance for the exemplary glass compositions of Table 1 as measured with an optical power meter;

[0045] FIG. 7 is another top view of a top emission tiled display comprising a plurality of display tiles arranged in rows and columns;

[0046] FIG. 8 is a side cross-sectional view of the display of FIG. 7;

[0047] FIG. 9 is a top view of an individual display tile of FIG. 7 showing individual light emitters arranged on the display tile;

[0048] FIG. 10 is a cross-sectional view of a portion of the display of FIG. 7 showing several ways in which light may leak from edges of individual tiles of the display;