along the contour within the workpiece, wherein a periodicity between adjacent defect lines is between 0.1 micron and 20 microns. The present application also describes glass articles prepared by this method.

[0007] Laser forming the plurality of defect lines along the contour within the workpiece can facilitate separating the workpiece along a surface defined by the contour to form a separated surface. The induced absorption can produce an Ra surface roughness of the cut and separated edge of less than or equal to about 0.5 micron. The induced absorption can also produce particles on the separated surface with an average diameter of less than 3 microns.

[0008] The developed laser method can be tailored for manual or mechanical separation of the parts from the panel or full laser separation by thermal stressing the desired profile. The method involves the utilization of an ultra-short pulse laser and can be followed by a CO_2 laser to create thermal stress, sometimes coupled with high pressure air flow, for fully automated separation.

[0008a] There is also disclosed a glass article comprising alkaline earth boro-aluminosilicate glass composite including at least one edge having a plurality of defect lines extending at least 250 microns, the defect lines each having a diameter less than or equal to about 5 microns.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The foregoing will be apparent from the following more particular description of example embodiments, as illustrated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the exemplary embodiments.

[0010] FIGS. 1A-1C are illustrations of a fault line (or perforated line) with equally spaced defect lines or damage tracks of modified glass.

[0011] FIGS. 2A and 2B are illustrations of positioning of the laser beam focal line, i.e., the processing of a material transparent for the laser wavelength due to the induced absorption along the focal line.

CLAIMS

1. A method of laser processing an alkaline earth boro-aluminosilicate glass composite workpiece, the method comprising:

focusing a pulsed laser beam into a laser beam focal line oriented along the beam propagation direction and directed into the alkaline earth boro-aluminosilicate glass composite workpiece, the laser beam focal line generating an induced absorption within the material, and the induced absorption producing a defect line along the laser beam focal line within the workpiece; and

translating the alkaline earth boro-aluminosilicate workpiece and the laser beam relative to each other along a contour, thereby laser forming a plurality of defect lines along the contour within the workpiece, wherein a periodicity between adjacent defect lines is between 0.1 micron and 20 microns.

2. The method of claim 1, further comprising separating the workpiece along the contour.

3. The method of claim 1, wherein the workpiece comprises a stack of plural display glass composite substrates.

4. The method of claim 1, wherein the pulsed laser has a laser power of 10W-150W and produces pulse bursts with at least 2 pulses per pulse burst.

5. The method of claim 1, wherein the laser beam focal line has a length in a range of between about 0.1 mm and about 10 mm and wherein the laser beam focal line has an average spot diameter in a range of between about 0.1 micron and about 5 microns.

6. The method of claim 1, wherein laser forming the plurality of defect lines along the contour within the workpiece facilitates separating the workpiece along a surface defined by the contour to form a separated surface, and wherein the induced absorption produces an Ra surface roughness of the cut and separated edge of less than or equal to about 0.5 micron.

7. The method of claim 1, wherein the alkaline earth boro-aluminosilicate glass composite workpiece is in the form of a glass sheet, and wherein focusing the pulsed laser beam and translating the workpiece and the laser beam relative to each other along the contour are performed with the glass sheet at an online draw.

8. The method of claim 1, wherein the induced absorption is produced such that the crack formation takes place in the microstructure of the substrate without ablation and without melting of material of the substrate.