[0004] Although Type 1A and Type 1B glass compositions are commonly used in pharmaceutical packages, they do suffer from several deficiencies, including a tendency for the interior surfaces of the pharmaceutical package to shed glass particulates or "delaminate" following exposure to pharmaceutical solutions.

[0005] In addition, use of glass in pharmaceutical packaging may also be limited by the mechanical performance of the glass. Specifically, the high processing speeds utilized in the manufacture and filling of glass pharmaceutical packages may result in mechanical damage on the surface of the package, such as abrasions, as the packages come into contact with processing equipment, handling equipment, and/or other packages. This mechanical damage significantly decreases the strength of the glass pharmaceutical package resulting in an increased likelihood that cracks will develop in the glass, potentially compromising the sterility of the pharmaceutical contained in the package.

[0006] Accordingly, a need exists for alternative glass containers for use as pharmaceutical packages which have improved resistance to mechanical damage and which exhibit a reduced propensity to delaminate.

SUMMARY

[0006a] In one aspect, the present disclosure relates to a delamination resistant glass pharmaceutical container comprising:

an aluminosilicate glass having a Class HGA 1 hydrolytic resistance when tested according to ISO 720-1985 testing standard, the aluminosilicate glass comprising greater than 70 mol.% and less than or equal to 80 mol.% SiO_2;

a compressive stress layer with a depth of layer of greater than 25 μm; and

a surface compressive stress of greater than or equal to 350 MPa, wherein the delamination resistant glass pharmaceutical container is ion exchange strengthened and the ion exchange strengthening comprises treating the delamination resistant glass pharmaceutical container in a molten salt bath for a time less than or equal to 5 hours at a temperature less than or equal to 450°C.

CLAIMS:

1. A delamination resistant glass pharmaceutical container comprising:

an aluminosilicate glass having a Class HGA 1 hydrolytic resistance when tested according to ISO 720-1985 testing standard, the aluminosilicate glass comprising greater than 70 mol.% and less than or equal to 80 mol.% SiO_2;

a compressive stress layer with a depth of layer of greater than 25 μm; and

a surface compressive stress of greater than or equal to 350 MPa, wherein the delamination resistant glass pharmaceutical container is ion exchange strengthened and the ion exchange strengthening comprises treating the delamination resistant glass pharmaceutical container in a molten salt bath for a time less than or equal to 5 hours at a temperature less than or equal to 450°C.

2. The delamination resistant glass pharmaceutical container of claim 1, wherein the delamination resistant glass pharmaceutical container has a type HGA1 hydrolytic resistance according to ISO 720 after ion exchange strengthening.

3. The delamination resistant glass pharmaceutical container of any of claims 1-2, wherein the delamination resistant glass pharmaceutical container has a threshold diffusivity of greater than 16 μm^2/hr at a temperature of less than or equal to 450°C.

4. The delamination resistant glass pharmaceutical container of any of claims 1-3,, wherein the threshold diffusivity is greater than or equal to 20 μm^2/hr at a temperature of less than or equal to 450°C.

5. The delamination resistant glass pharmaceutical container of any of claims 1-4, wherein the delamination resistant glass pharmaceutical container is free of boron and compounds of boron.

DELAMINATION RESISTANT GLASS CONTAINERS WITH HEAT-TOLERANT COATINGS

ABSTRACT

Delamination resistant glass containers with heat-tolerant coatings are disclosed. In one embodiment, a glass container may include a glass body having an interior surface, an exterior surface and a wall thickness extending from the exterior surface to the interior surface. At least the interior surface of the glass body is delamination resistant. The glass container may further include a heat-tolerant coating positioned on at least a portion of the exterior surface of the glass body. The heat-tolerant coating may be thermally stable at temperatures greater than or equal to 260°C for 30 minutes.

(Fig. 1)