[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 refers to a delamination resistant glass pharmaceutical container: a glass body having an interior surface and an exterior surface, wherein at least the interior surface of the glass body has a delamination factor of less than or equal to 10; and a heat-tolerant coating bonded to at least a portion of the exterior surface of the glass body, wherein the heat-tolerant coating has a thickness of less than about 90 nm, and wherein the exterior surface of the glass body with the heat-tolerant coating has a coefficient of friction of less than about 0.7, wherein the coefficient of friction is a maximum coefficient of friction measured relative to a second glass container in a vial-on-vial testing jig under a normal load of 30 N, the second glass container having a body formed from a same glass composition and comprising the heat-tolerant coating on an at least a portion of the outer surface of a body of the second glass container and subjected to the same environmental conditions prior to measurement.

[0007] According to one example, a glass container may include a glass body having an interior surface and an exterior surface. At least the interior surface of the glass body may have a delamination factor of less than or equal to 10 and a threshold diffusivity of greater than about 16 μm^2/hr at a temperature less than or equal to 450°C. A heat-tolerant coating may be bonded to at least a portion of the exterior surface of the glass body. The heat-tolerant coating may be thermally stable at a temperature of at least 260°C for 30 minutes.

[0008] In another example, a glass container may include a glass body having an interior surface and an exterior surface. At least the interior surface of the glass body may have a delamination factor of less than or equal to 10 and a threshold diffusivity of greater than about 16 μm^2/hr at a temperature less than or equal to 450°C. A heat-

CLAIMS

1. A delamination resistant glass pharmaceutical container:

a glass body having an interior surface and an exterior surface, wherein at least the interior surface of the glass body has a delamination factor of less than or equal to 10; and

a heat-tolerant coating bonded to at least a portion of the exterior surface of the glass body, wherein the heat-tolerant coating has a thickness of less than about 90 nm, and wherein the exterior surface of the glass body with the heat-tolerant coating has a coefficient of friction of less than about 0.7,

wherein the coefficient of friction is a maximum coefficient of friction measured relative to a second glass container in a vial-on-vial testing jig under a normal load of 30 N, the second glass container having a body formed from a same glass composition and comprising the heat-tolerant coating on an at least a portion of the outer surface of a body of the second glass container and subjected to the same environmental conditions prior to measurement.

2. The delamination resistant glass pharmaceutical container of claim 1, wherein:

the heat-tolerant coating is thermally stable at a temperature of at least 260°C for 30 minutes.

3. The delamination resistant glass pharmaceutical container of any of claims 1-2, wherein the heat-tolerant coating is thermally stable at a temperature of at least 320°C for 30 minutes.

4. The delamination resistant glass pharmaceutical container of any of claims 1-3, wherein the glass body has an interior region extending from below the interior surface of the glass body and into a wall thickness of the glass body, the interior region having a persistent layer homogeneity.

5. The delamination resistant glass pharmaceutical container of any of claims 1-4, wherein the interior surface of the glass body has a persistent surface homogeneity.

6. The delamination resistant glass pharmaceutical container of any of claims 1-5, wherein the glass body comprises an aluminosilicate glass composition.