Valor® Glass helps protect patients and improve pharmaceutical manufacturing.

Product Information

Benefits of Valor Glass

- Eliminates glass delamination
  - Chemically-durable drug contacting surface with uniform surface chemistry
- Reduces glass particulate generation
  - Valor Glass has a low coefficient of friction surface that reduces particulate generation and enhances machinability
- Resists damage and breakage
  - Exceptional damage resistance and retained strength throughout processing
- Enables higher throughput through smoother filling line operations
  - Valor Glass containers reduce line interventions, enabling lines to run at higher efficiency and higher speeds with improved yields.
- Prevents cracks
  - In laboratory testing, Valor Glass vials provide at least 30x protection against cracks than conventional borosilicate glass vials

Valor Glass is compatible with:

- Parenteral product types including container closure systems: liquid, powder, and lyophilized
- Challenging and routine lyophilization cycles
- Existing sterilization techniques
- Dimensions and product specifications: ISO and custom formats available upon request
- Quality Assurance: 100% automated inspection
- Regulatory Compliance: Valor Glass vials meet USP and Ph. Eur. Type I hydrolytic criteria
Eliminates glass delamination
The composition and homogenous interior surface of Valor® Glass containers make them ideal for the protection of drug products.

<table>
<thead>
<tr>
<th>Glass Components</th>
<th>Valor Glass (Approximate Weight %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass Formers</td>
<td></td>
</tr>
<tr>
<td>SiO₂</td>
<td>72 – 75</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>9 – 12</td>
</tr>
<tr>
<td>B₂O₃</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Fluxes</td>
<td></td>
</tr>
<tr>
<td>Na₂O</td>
<td>10 – 13</td>
</tr>
<tr>
<td>K₂O</td>
<td></td>
</tr>
<tr>
<td>Property Modifiers</td>
<td></td>
</tr>
<tr>
<td>MgO</td>
<td>3 – 4.5</td>
</tr>
<tr>
<td>CaO</td>
<td></td>
</tr>
<tr>
<td>Fining Agents</td>
<td></td>
</tr>
<tr>
<td>SnO₂</td>
<td>0.1 – 1</td>
</tr>
<tr>
<td>As₂O₅</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Cl</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>

Chemical Resistance

<table>
<thead>
<tr>
<th>Property</th>
<th>ISO 719</th>
<th>Meets HGB 1 Criteria</th>
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</thead>
<tbody>
<tr>
<td>Hydrolytic Resistance</td>
<td>Ph. Eur. 3.2.1/USP &lt;660&gt;</td>
<td>Meets Type I Hydrolytic Criteria</td>
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<tr>
<td>Soluble Alkali Test</td>
<td>JP 7.01</td>
<td>Meets Criteria</td>
</tr>
<tr>
<td>Acid Resistance Class</td>
<td>DIN 12116</td>
<td>Class S1</td>
</tr>
<tr>
<td>Alkali Resistance Class</td>
<td>ISO 695</td>
<td>Class A2</td>
</tr>
</tbody>
</table>

Extractable concentrations by ICP-MS
Valor Glass exhibits lower extractable concentrations against a wide range of pHs.

3 ml containers used during extractable testing underwent a two minute hot water rinse followed by depyrogenation at 320 ºC for 60 minute prior to test execution. The containers were then filled with appropriate solutions to a fill volume of 3.5 ml, stoppered and autoclaved for 1 hour at 121 ºC, then stored at 50 ºC for 30 days.

Test conditions above are approximately equivalent to 639 days at room temperature (25 ºC) or 121 days at accelerated (40 ºC).

* ICH Q3D Class 1 (Cd, Pb, As, Hg), Class 2A (Co, V, Ni). Class 2B (Ti, Au, Pd, Ir, Os, Ru, Se, Ag, Pt), Class 3 (Li, Sb, Ba, Mo, Cu, Cr) elements are not added to the glass composition and were below analytical evaluation thresholds.
Reduces glass particulate generation
Valor® Glass is inherently strong, making it able to withstand extreme events during the pharmaceutical processing and field applications.

Visible scratches are less evident after pharmaceutical processing with Valor® Glass vials (right) compared to borosilicate containers (left)

Particles In Solution
In Solution particles measured by USP <788> light obscuration method; samples collected during an engineering trial

Resists damage and breakage
Valor Glass can show up to 10x improvement in compression testing compared to conventional vials

Throughput Improvement
Valor Glass vials have shown significant improvement in line throughput on various commercial filling lines.
Prevents cracks
In laboratory testing, Valor® Glass vials provide at least 30x protection against cracks than conventional borosilicate glass vials.

Borosilicate

Cross-Section of Glass

Minor Damage

Moderate Damage

Severe Damage

Borosilicate glass has low internal energy
Non-penetrating surface check may grow into crack with subsequent load
Penetrating crack loss of sterility
Complete break separating into two or more pieces

Corning Valor Glass

Cross-Section of Glass

Minor to Moderate Damage

Severe Damage

Valor Glass is engineered with higher internal energy
Surface flaws contained within compression layer do not propagate
Deep checks propagate and complete break, separating into two or more pieces