Air Bubbles in Glass Beads

Date: 2006-Jul-20, 2:14:02 PM -04'00'
Company: Clemex
Department: Lab
User Name: Clemex (signed on 2006-Jul-20 10:39:32 -04'00')
Sample ID: Bubbles in glass beads

Magnification: 9
Calibration: 22.5904 µm/pixel
Units: microns
# Fields: 3

Figure 1: Typical field of view.

Comment:
The analysis was performed using a stereoscope Leica MZ16A with transmitted light to avoid most reflection problems. Detected features that were connected to the beads outline were eliminated. All particles having an aspect ratio over 4 and artifacts (fitting inside a 3 x 3 pixels box) were also eliminated. Each bead was measured for its Length (maximum feret) and Width (minimum feret). Each bubble was measured for its Diameter and Area. A total count of beads and bubbles was performed along with a count of bubbles per bead.
Air Bubbles in Glass Beads

**Glass Bead Measurements:**

<table>
<thead>
<tr>
<th>Min</th>
<th>15</th>
<th>Max</th>
<th>3026.80</th>
<th>Mean</th>
<th>33227.61</th>
<th>Std Dev</th>
<th>134215.33</th>
<th>Count: 25</th>
</tr>
</thead>
</table>

**Air Bubble Measurements:**

<table>
<thead>
<tr>
<th>Min</th>
<th>0.00</th>
<th>Max</th>
<th>21446.72</th>
<th>Mean</th>
<th>8810.24</th>
<th>Std Dev</th>
<th>94.74</th>
<th>Count: 15</th>
</tr>
</thead>
</table>

**Quantity of bubbles per bead**

<table>
<thead>
<tr>
<th>Child Count BPL2</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>25</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>25000</td>
<td>20000</td>
</tr>
<tr>
<td>Cumulative (%)</td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>
Image Analysis Steps

Figure 1: Original image at 9x

Figure 2: Defects as first detected including part of the beads outline.
Image Analysis Steps

Figure 3: Artifacts were eliminated and remaining features were considered as bubble and filled.

Figure 4: Glass beads (in outline view) and air bubbles, as measured.