

TECH Notes

Controlled Defects in Glass

Assessing Glass Strength Using Controlled Defects

● TN1003 Rev. A0

Brittle Fracture is a Statistical Process

Brittle fractures occur by the propagation of a flaw to the point where it exceeds the critical crack length for a particular material. At that point, catastrophic failure occurs nearly instantaneously. Glass that might be used in a touchscreen device or an energy saving exterior glazing is prone to such brittle-fracture behavior. The probability of failure of a piece of glass correlates with the probability of a flaw of critical length existing within the glass, in a zone being stressed. So the probability of failure depends both on the amount of load or stress on the piece of glass, as well as the glass flaw distribution.

Improving the Resistance to Glass Failure

To increase the durability of these important applications of glass, there is much interest in research that can:

1. Reduce the sub-critical crack growth rate
2. Increase the critical crack length
3. Arrest the propagation of a crack which otherwise would result in catastrophic failure

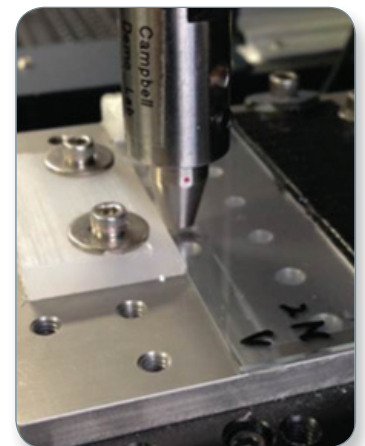
A number of approaches are being investigated in this regard, including:

- Coatings
- Compositional modifications
- Microstructural and/or processing changes

Research Tools Available

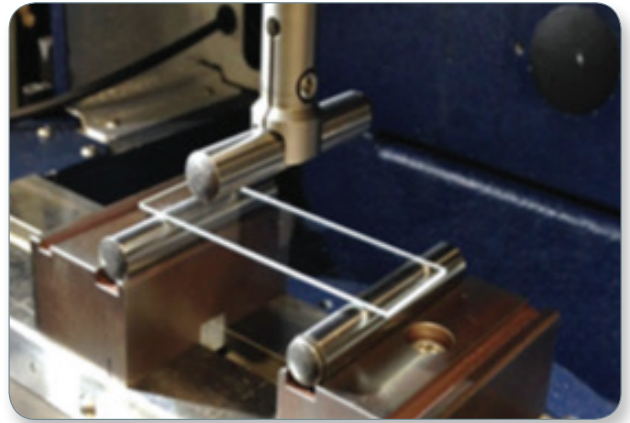
To aid in the research and assessment of methods to improve glass fracture resistance, a means to provide controlled defects in glass can be used. By imparting known defects into a set of glass samples of reasonable statistical size (e.g., 10), and then fracturing these samples under known, controlled conditions, the effect of various treatments can be determined.

A Bruker UMT, equipped with a standard diamond tip, such as a Rockwell indenter, can be used to apply scratches of a



Creating controlled defects in glass.

precise and repeatable length and depth under servo-feedback controlled conditions. Subsequently, a three-point-bend fixture can be installed on the UMT to then fracture the glass under controlled conditions.



3-point-bend fixture for glass testing.

Bruker Nano Surfaces Division

Campbell, CA • USA
Phone +1.408.376.4040/866.262.4040
productinfo@bruker.com
www.bruker.com/nano