

## STRENGTH OF Li<sub>2</sub>O-SiO<sub>2</sub> SYSTEM TRANSPARENT GLASS-CERAMICS

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### Abstract

The relationship between fracture strength and crystal size in the Li<sub>2</sub>O-SiO<sub>2</sub>-system transparent glass-ceramics was investigated. The precipitated crystal phase, percent crystallinity and crystal size were Li<sub>2</sub>O-2SiO<sub>2</sub>, 60-80% and 20-60% nm, respectively, following heat treatment below 800° C for 5-144 h. It is found that fracture strength increases linearly with increasing crystal size in the range of 20-60 nm for both non abraded and abraded specimens. Fractures strength can be expressed as a function of crystal size, d (nm), by

$$\sigma = 100.5 + 2.32d \text{ (MPa) [Non-abraded]}$$

$$\sigma = 56.3 + 0.99d \text{ (MPa) [Abraded]}$$

This result shows the opposite tendency for previous result of glass-ceramics of micrometer order crystals. This indicates that very fine crystals cannot effectively interrupt crack propagation, and hence, the stress required for changing the direction of propagation might be small. It can be considered that a critical crystal size may exist for the attainment of the maximum strength.

**Keywords:** Li<sub>2</sub>O-SiO<sub>2</sub> system, Transparent glass-ceramics, Nanocrystals, Fracture strength

**Published in :** Journal of Ceramic Society of Japan, Vol. 112, 2004, pp. 259-262.