

Postfailure subsidiary cracking from indentation flaws in brittle materials

Nitin P. Padture^{a)}

*Materials Science and Engineering Laboratory, National Institutes of Standards and Technology,
Gaithersburg, Maryland 20899*

(Received 20 July 1992; accepted 10 February 1993)

Vickers indentation sites in ceramics have been examined after specimen failure from median/radial indentation cracks. Evolution of a new cracking pattern of “ortho-lateral” cracks, originating at the intact corners of the Vickers indentation and running orthogonal to the classic-lateral cracks and parallel to the new fracture surface, has been observed. In some instances postfailure extension of the classic-lateral cracks toward the surface was also observed. Enhanced residual tensile stress from relaxation of constraints on the indentation-plastic cavity by the generation of a fracture surface is postulated to drive the subsidiary cracking. A simple qualitative model to explain this phenomenon is presented. Possible implications of such postfailure subsidiary cracking on residual-stress-driven flaws, postmortem fractography, and wear in ceramics are discussed.

Keywords: Ceramics; Glass; Mechanical properties

Materials: Al₂O₃; MgO; Soda-Lime-Silica glass

J. Mater. Res., Vol. 8, No. 6, p. 1411. © 1996 Materials Research Society