

Abstract Submitted
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The dynamics of cracks in torn thin sheets YOSSI COHEN, ITAMAR PROCACCIA, Department of Chemical Physics, The Weizmann Institute of Science, Rehovot 76100, Israel — The stress field near the tip of a crack due to a mode III shear tearing of a thin plate of elastic material has a universal form but with a non-universal amplitude known as the Stress Intensity Factor. All the non-universal aspects of the stress distribution are collected in the Stress Intensity Factor which depends on everything, including the crack length, the boundary conditions and the history of the loads that drive the crack evolution. Although the equations of elasticity for thin plates are well known, there remains the question of selection of a path for a propagating crack. We invoke a generalization of the principle of local symmetry to provide a criterion for path selection and demonstrate the qualitative agreement of our results with the experimental findings. We also analyze the nature of the singularity at the crack tip with and without the nonlinear elastic contributions. Finally we present an exact analytic results for the stress intensity factor to the linear approximation for the crack developing in thin sheets.

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