

# **On the Essential Work of Fracture Approach for Toughness Evaluation of Ductile Materials in Plane Stress**

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Many engineering polymers and their blends are tough and the conventional fracture parameters, such as the critical potential energy release rate  $G_c$  and critical stress intensity factor  $K_{Ic}$ , are inapplicable as they are only valid for linear elastic fractures. Post-yield J-integral or crack-tip opening displacement (CTOD) characterization is problematical due to certain experimental difficulties. To overcome these problems, a review is given on the now accepted essential work of fracture approach, which was developed at Sydney University, to determine valid fracture toughness under these circumstances. The theoretical concept will be presented and examples in support of the theory will be taken from data obtained from a range of ductile polymer sheets and their blends covering the effects of temperature and loading rates under mode I crack opening. We will also extend our fracture analysis and experiments to the out-of-plane tearing mode III that is more relevant for failure of thin films.