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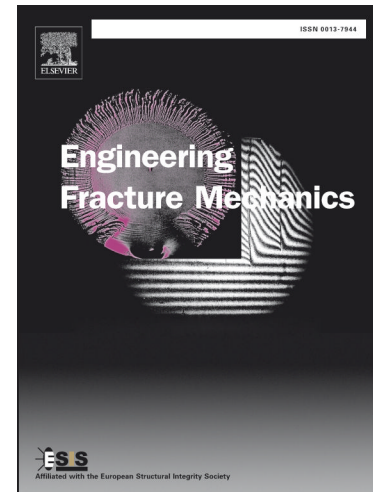
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Fracture Toughness Evaluation of Interstitial Free Steel Sheet using Essential Work of Fracture (EWF) Method

S.K. Chandra^a, R.Sarkar^a, A.D. Bhowmick^a, P. S. De^b, P. C. Chakraborti^{a*} and S.K. Ray^a

^aMetallurgical and Material Engineering Department, Jadavpur University, Kolkata 700032

^bDepartment of Engineering Design, Indian Institute of Technology, Madras 600036

* Corresponding Author: e-mail: pravashchandrachakraborti@hotmail.com

Abstract

Essential Work of Fracture (EWF) method has been used to evaluate ductile tearing resistance of interstitial-free (IF) steel sheet of 1 mm thickness. Experiments have been done on double edge notched tensile (DENT) specimens with and without fatigue precracking at three different quasi-static ramp rates. The fracture in all cases was flat with maximum specimen necking of 36% of thickness. The estimated crack tip opening angle (CTOA, ψ^e) was found to be essentially independent of ρ , and also of deformation rate. The critical CTOA (φ_e) was optically estimated using a precracked DENT specimen. Also, the tearing resistance parameters obtained from EWF tests have been compared with that determined using 3-dimensional Finite Element Modeling (FEM). Results of FEM, along with a chosen traction-separation law, were used in a 3-dimensional Cohesive Zone Model (CZM) for flat fracture to simulate crack growth behavior in the DENT specimens.

Key words: Interstitial free (IF) steel; Tearing resistance; EWF method; Crack tip opening angle; Cohesive zone model.

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