

Article Abstract

Title:	Mixed-mode (I/II) crack initiation direction for elastic-plastic materials based on crack-tip plastic zone
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Journal:	<i>International Journal of Engineering, Science and Technology</i> , Vol. 2, No. 11, 2010, pp. 113-122.
Abstract:	In this paper, crack-initiation direction for an elastic-plastic material (interstitial free steel) under mixed-mode (I/II) load is studied based on crack-tip plastic zone under monotonic load. The feasibility of using the minimum plastic zone radius (MPZR) criterion for elastic-plastic materials is also examined. The shape and size of crack-tip plastic zones have been estimated by elastic-plastic finite element analysis in a plane stress single edge notch tensile (SENT) specimen under mixed-mode (I/II) loading according to von Mises yield criteria. The results show that the minimum plastic zone sizes were not clearly identified; indicating MPZR criterion is not suitable for the analysis of elastic-plastic materials. It is shown that the crack initiation direction for elastic-plastic materials depends on the path of the maximum plastic zone size. The variation of crack initiation angle is also studied with respect to mode mixity factor and the results are found to be in good agreement with the experimental results available in the literature.
Keywords:	plastic zone size, J - integral, mixed mode (I/II), finite element analysis, mode mixity, SENT specimen