

Evaluating MTS criterion in predicting mixed-mode crack extension under different loading conditions

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Abstract

The maximum tangential stress (MTS) criterion is one of the most widely used criteria for predicting the direction of crack extension. The suitability of this criterion is examined under different loading conditions using extended finite element method (XFEM). Experimental and numerical results reported in the literature are considered to evaluate the validity and accuracy of the criterion. The results demonstrate that the MTS criterion evaluated by stress intensity factors (SIF) can accurately predict the direction of crack propagation in specimens under direct tensile loading. This criterion overestimates the angle of crack initiation in the specimen under indirect tensile loading, but underestimates the angle in the specimen subjected to three-point bending. It is concluded that the MTS criterion based on SIF could not accurately predict the direction of the crack initiation, which could, however, be determined properly based on the stress distribution around the crack tip obtained by XFEM numerical models.

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