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Fatigue crack growth simulation under cyclic non-proportional mixed mode loading

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Abstract

An algorithm based on linear elastic fracture mechanics for three-dimensional fatigue crack growth simulation under non-proportional mixed-mode loading is proposed in the present paper. The crack growth behaviour in thin-walled, hollow cylinders with a notch under combined non-proportional cyclic tension and torsion loadings are investigated with the finite element program ABAQUS and a 3D fracture analysis software FRANC3D. Different mixed-mode crack path prediction criteria are evaluated to estimate the crack growth direction. Fracture mode transition is observed, some influence factors are discussed. Crack growth cycles calculated based on the effective stress intensity factors satisfactorily match the experimental data for specimens tested under lower loading levels.

Keywords

Fatigue crack growth, Linear elastic fracture mechanics, Non-proportional loading, Mixed mode

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