

Mathematical model of elastic crack interaction and two-dimensional finite element analysis based on Griffith energy release rate

Abstract

Stress shielding interaction effect of two parallel edge cracks in finite body under uniaxial loading is analysed using developed finite element (FE) analysis program. In present study, the stress shielding interaction is formulated as a mathematical model called stress shielding damage (SSD) model. SSD model used to define the combination and re-characterization of crack interaction from multiple cracks to single crack. Focus is given to weak crack interaction state as the crack interval exceed the length of cracks ($b > a$). The crack interaction factors are evaluated based on Griffith strain energy release rate and mode I SIF using J-integral analysis. For validation, the stress shielding factor parameters are compared to single edge crack SIF as a state of zero interaction in a form of crack unification limit (CUL) and crack interaction limit (CIL).

Keywords

Crack interaction; Interacting cracks; Stress shielding effects