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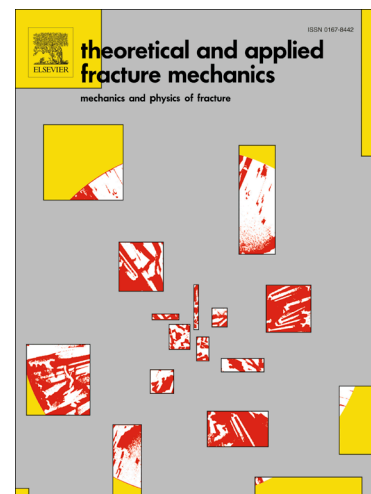
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Analysis of semi-elliptical surface cracks in the interface of bimaterial plates under tension and bending

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Abstract: A semi-elliptical surface crack widely exists in the multilayered electronic devices, fibre reinforced laminated composites and solder joints. To ensure the safety of these structural components, three-dimensional interface fracture mechanics analysis is required. In this study, three-dimensional finite element analyses have been conducted to calculate the fracture mechanics parameters, including the stress intensity factors (SIFs), the strain energy release rate G and two phase angles ψ and ϕ for semi-elliptical interface surface cracks in finite thickness plates. A wide range of crack aspect ratios and relative depths are considered. The SIF computations are presented along the front of a three-dimensional bimaterial interface cracks with a/t values of 0.2, 0.4, 0.6 or 0.8 and a/c values of 0.2, 0.4, 0.6 or 1.0. In particular, far-field loads i.e., remote tension and bending, and various combinations of materials are investigated. These fracture mechanics parameters' solutions are suitable for fracture and fatigue life prediction for semi-elliptical bi-material interface surface cracks in engineering components.

Keywords: Interface cracks; Stress intensity factors; Strain energy release rate; Three-dimensional finite element analysis; semi-elliptical surface crack.

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