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Details of the integral equation method applied to the analysis of an adhesive layer crack.
(English) Zbl 0933.74078

We examine numerically the mathematical model for a crack in an elastic adhesive layer sandwiched between two adherends proposed by N. A. Fleck et al. [ibid. 27, No. 13, 1683-1703 (1991)]. The elastic mismatch between the adhesive and adherend materials modifies the far-field values of the stress intensity factors and of the T-stress in a manner that depends on the position of the crack inside the layer and on the Dundurs parameters. A complex-potential stress-function formulation, using dislocation distributions represented by truncated Chebyshev series, provides an integral equation that we solve numerically by the method of collocations. The computational aspects of the solution are studied in detail using two programming languages. MATHCAD and C++, run on standard PC hardware.

MSC:
74S25 Spectral and related methods applied to problems in solid mechanics
74R10 Brittle fracture
74G70 Stress concentrations, singularities in solid mechanics

Keywords:
fast Fourier transform; cosine Fourier integrals; convergence; stress intensity factors; T-stress; Dundurs parameters; complex-potential stress-function formulation; dislocation distributions; truncated Chebyshev series; MATHCAD; C++

Software:
Mathcad

Full Text: DOI