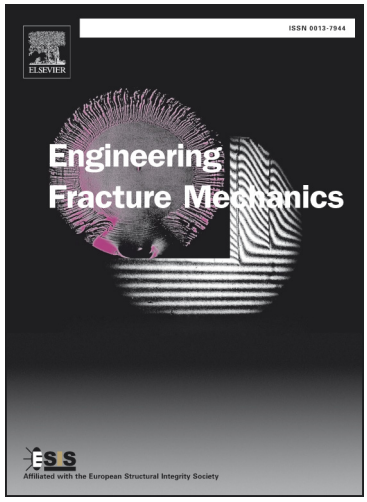

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Bi-material transversely isotropic half-space containing penny-shaped crack under time-harmonic horizontal loads

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Abstract An analytical solution is presented for a two-layer transversely isotropic linear elastic half-space containing a disc-shaped crack placed at the interface of the layers. The axes of material symmetry of the top layer and the lower half-space are assumed to be depth-wise and perpendicular to the surfaces of the crack, which are parallel to the free surface of the half-space. The crack surfaces are affected by time-harmonic arbitrary distribution self-equilibrium horizontal tractions, which is related to mode II of fracture. The coupled equations of motion in each region of the domain are uncoupled with the use of two scalar potential functions, and the governing equations for the potential functions are solved with the use of Fourier expansion and Hankel integral transforms. Because of integral transforms used in this paper, the mixed boundary value problem involved here are changed to a set of coupled dual integral equations, which are analytically solved for the static case of bi-material full-space as a special case of two-layer half-space. For the dynamic problem, the integral equations are solved numerically with the aid of the finite element method. The solution is degenerated for the isotropic case, which itself is new in the literature. In addition, some numerical results are provided to show how the degree of anisotropy and thickness of the top layer affect the problem.

Key words: Disc-shaped crack; transversely isotropic; mode II, bi-material half-space; coupled dual integral equations.

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