INTERFACE CRACKS UNDER HARMONIC HEAR: EFFECTS OF CONTACT AND FRICTION

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ABSTRACT

The linear crack between two dissimilar elastic isotropic half-spaces under normal harmonic shear loading is considered. The system of boundary integral equations for displacements and tractions at the interface is derived from the dynamic Somigliana identity in the frequency domain [1]. To take the crack faces' contact interaction into account we assume that the contact satisfies the Signorini normal contact constraints and the Coulomb friction law. The components of the solution are represented by the trigonometric Fourier series. The problem is solved numerically using the iterative process – the solution changes until the distribution of the displacements and tractions satisfying the contact constraints is found [2]. The numerical convergence of the method with respect to the number of the Fourier coefficients and the mesh size is analysed for different frequencies of the loading. The effects of material properties and values of the friction coefficient on the distribution of stress intensity factors (opening and shear modes) are presented and discussed. Special attention is paid to the length of the contact zone and the results are compared with the classical model solutions obtained for the static problems with friction [3]. In the future, the approach might be applied to three-dimensional fracture mechanics problems for layered cracked materials under dynamic loading with friction.

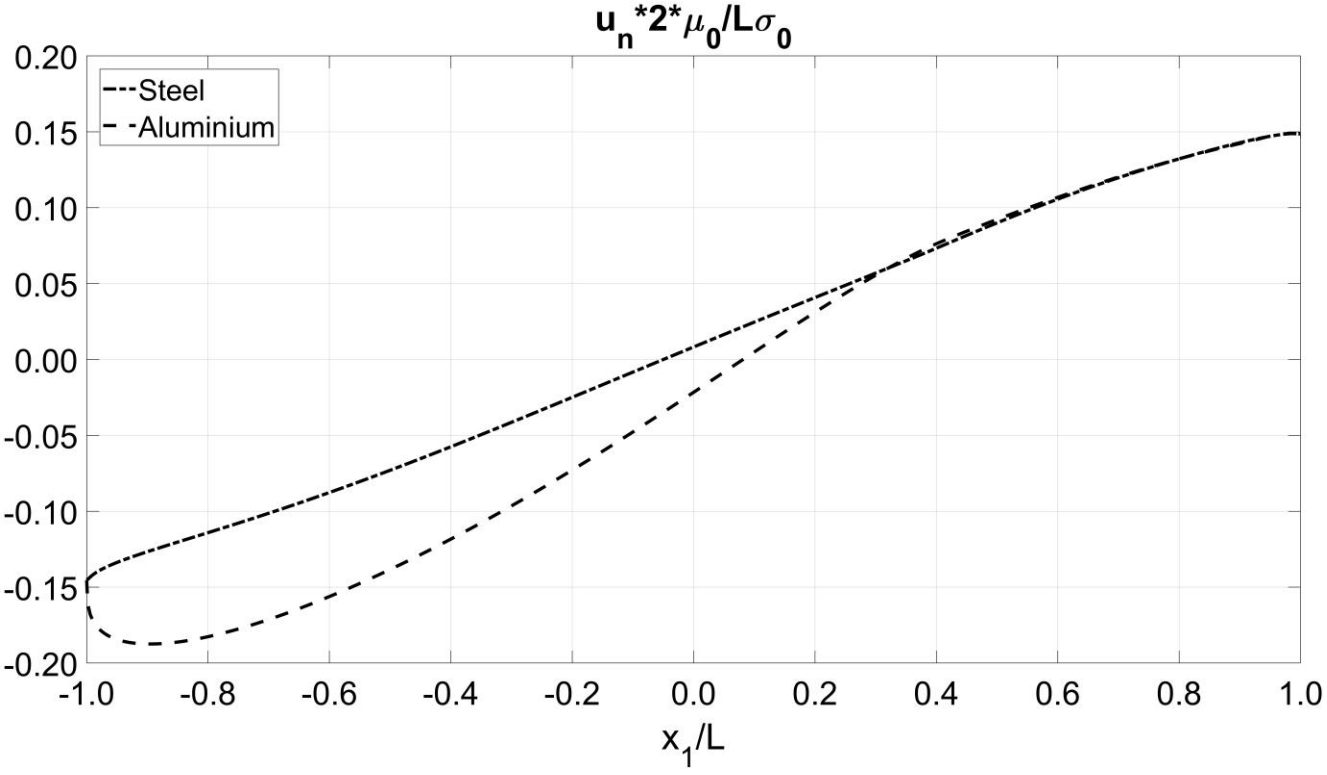

Figure 1: Max normal displacements of Steel-Aluminium faces, dimensionless wave number 1.0, friction coefficient 1.0

Keywords: Interface Crack, Boundary Integrals, Contact Zone, Stress Intensity Factors.

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