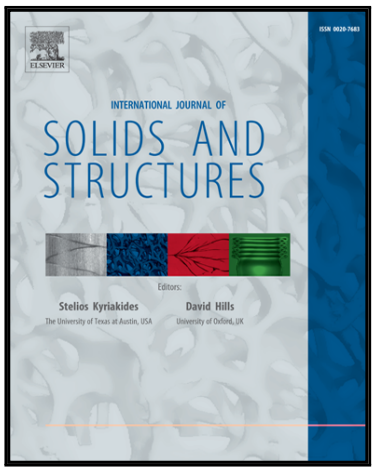

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An effective method for the sliding frictional contact of a conducting cylindrical punch on FGPMs

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Abstract

This paper presents an effective method to solve the sliding frictional contact between a rigid conducting cylindrical punch and a functionally graded piezoelectric coated half-plane. The electro-mechanical properties of the functionally graded piezoelectric materials (FGPMs) are position dependent along the thickness direction in the form of an exponential function against the thickness coordinate. A constant surface electric potential is assumed for the punch and the friction is of the Coulomb type. Using the superposition theorem and the Fourier integral transform, the present problem is reduced to a set of coupled Cauchy singular integral equations. These integral equations are then numerically discretized to form an overdetermined system which may lead to a non-unique solution for the conducting cylindrical punch problem. By using the least squares method together with an iterative procedure, the overdetermined algebraic equations are effectively solved to obtain the optimal solution. The effects of the friction coefficient and gradient index on the surface electro-mechanical fields are discussed.

Keywords: Friction; Conducting cylindrical punch; FGPM coating; Least squares method

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