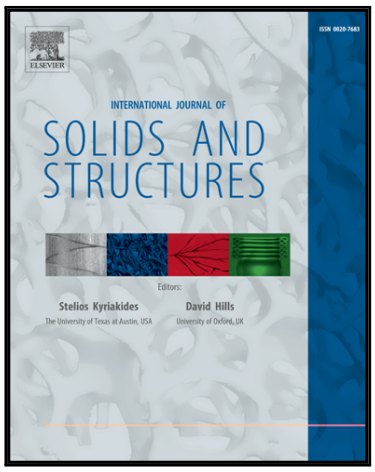

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ANALYTICAL ELASTIC MODELS OF FINITE CYLINDRICAL AND TRUNCATED SPHERICAL INCLUSIONS

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Abstract

We develop a new technique for finding elastic fields for axisymmetric dilatational inclusions (DIs) in the forms of finite cylinder and truncated sphere, when the DIs and surrounding infinite matrix have the same isotropic elastic moduli. DIs are built of circular dilatational disks distributed continuously along the axis of symmetry. Total displacements of DIs are found by integration of the displacements of a dilatational disk. Then, using the linear elasticity equations, the elastic fields of cylindrical and truncated spherical DIs are derived and written via compact easy-to-read and easy-to-calculate Lipschitz-Hankel integrals and Lur'e series, correspondingly. The independence of the strain energy and the elastic dilatation on the DI shape is confirmed. The effect of the aspect ratio and the shape on the elastic fields of the DIs analyzed. The elastic model of Janus particle and other possible useful applications of solved problems are discussed.

Keywords

Analytical solutions; Axisymmetric; Elasticity; Inclusions; Finite cylinder; Truncated sphere; Janus particles; Lipschitz-Hankel integrals; Lur'e series