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夹杂尖端出现裂纹时应力奇异性分析

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STRESS SINGULARITY ANALYSIS FOR A CRACK INITIATING AT A FLAT INCLUSION TIP

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摘要 本文应用奇异积分方程理论研究一扁平夹杂尖端出现一裂纹时的应力奇异性问题。得到了裂纹与夹杂端点及交点处的应力奇异性指数,导出了裂纹与夹杂端点处的应力强度因子及交点处的新近应力场。通过数值计算,分析讨论了裂纹与夹杂的各种几何参数及夹杂-母体材料刚度比对裂纹与夹杂相互作用的影响。

关键词: 夹杂 裂纹 应力奇异性

Abstract: In this study the stress singularity problem that a crack initiates at the tip of a flat elastic inclusion embedded in an elastic solid is considered. The angle between the inclusion and the crack can be arbitrary. The problem is reduced to a system of four singular integral equations which can be transformed to those having normal Cauchy kernels and generalized Cauchy kernels. By means of the function-theoretic technique, the stress singularity powers at singular points, the asymptotic stress fields around the intersection point, the stress intensity factors at the tips of the crack and the inclusion are obtained. Through some numerical calculations, the effects of the modulus ratio of the inclusion to the matrix, the relative size and orientation of the inclusion and the crack, the stress intensity factors at the tips of the inclusion and the crack, and the stresses along the inclusion are discussed.

Keywords: inclusion crack stress singularity

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