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压电体椭圆孔边的力学分析

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摘要 基于复变函数的方法，以PZT-4材料为例，分别采用精确电边界条件和非导通电边界条件进行了远场均匀载荷作用下的横观各向同性压电体椭圆孔的力学分析并与相关结果进行对比. 结果表明当椭圆孔退化为圆孔时，无论在远场作用力载荷或电载荷，两种电边界条件下的结果均能完全吻合. 随着椭圆孔的愈加尖锐化，非导通电边界条件逐渐不能适用.

关键词 横观各向同性,压电体,椭圆孔,圆孔,电边界

分类号

On the problem of piezoelectric solid with an elliptic hole

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Abstract

An electroelastic analysis is performed on a transversely isotropic material containing elliptic hole, which subject to a uniform stress field $\sigma ^\infty $ and a uniform electric displacement field $D^\infty $ at infinity while the surface of the hole is free of traction and electrically open. Taking PZT-4 ceramic into consideration, the results based on the exact electric boundary conditions and the impermeable electric boundary conditions are all obtained. It can be seen that the related results of these two electric boundary conditions are entirely identical when the hole is a circular hole. The impermeable electric boundary condition is becoming incorrect with the elliptic hole degenerating into a crack. A comparison between these present results and the related results shows that the present results are validity. It also shows that some results given by Sosa are incorrect maybe due to his calculation, not the impermeable electric boundary.

Key words transversely isotropic piezoelectric elliptical hole circular hole electric boundary

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