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功能梯度压电双材料板中厚度−扭曲波的传播

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PROPAGATION OF THICKNESS-TWIST WAVES IN A FUNCTIONALLY GRADED PIEZOELECTRIC BI-MATERIAL PLATE

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摘要

分析了厚度-扭曲波在无限大功能梯度压电双材料板中的传播性能,板的上表面和下表面是机械自由和电学开路的,材料常数在厚度方向按指数规律变化。首先推导了满足控制方程和边界条件的电弹场,然后利用界面条件得到了厚度-扭曲波传播所应满足的关系。通过算例表明了材料梯度变化对厚度-扭曲波传播性能的影响,结果对功能梯度压电材料在声波器件中应用有参考价值。

关键词: 功能梯度材料　压电材料　双材料板　厚度-扭曲波　反平面变形

Abstract：

This paper analyzes the thickness-twist wave propagating in a functionally graded piezoelectric bi-material plate. The upper and lower surfaces of the plate are mechanically free and electrically open. The material properties of the plate vary exponentially along the plate thickness. The electro-elastic fields satisfying the governing equations and the boundary conditions are firstly derived. Then the interfacial continuous conditions are utilized to obtain the relations that should be satisfied by thickness-twist waves. A numerical example is provided to show the effect of the material inhomogeneity on propagation characteristics of thickness-twist waves. The obtained results may be useful for the application of functionally graded piezoelectric materials to acoustic wave devices.

Key words： functionally graded materials　piezoelectric material　bi-material plate　thickness-twist waves　anti-plane deformation

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