

采用弹性基底的磁电复合结构有限元分析

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基金项目:

摘要:

介绍了一种将磁致伸缩材料和压电材料粘贴于弹性基底上构成的磁电复合结构, 并针对Terfenol-D尺寸确定情况下, PZT-5H长度及弹性基底长度对结构一阶纵向谐振时的磁电特性的影响, 采用有限元方法进行了优化分析和设计。结果表明, PZT-5H的最优长度为与Terfenol-D等长; 在此前提下, 弹性基底存在最优长度使得结构磁电转换系数最高, 且改变弹性基底长度可以调整结构的谐振频率, 并进行了实验验证。

关键词: 磁电复合结构, 弹性基底, 谐振, 有限元分析

Finite-element Analysis of the Magnetolectric Composite Using Elastic Substrate

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Abstract:

A magnetolectric composite by bonding magnetostrictive and piezoelectric materials onto an elastic substrate is presented. The magnetolectric composite using elastic substrate is analyzed by finite-element analysis. Given the dimensions of Terfenol-D, the influences of the length of PZT-5H and the elastic substrate on the magnetolectric behaviors at the first-order longitudinal resonant are presented. Results show that the optimized length of PZT-5H is equal to the length of Terfenol-D. When the lengths of Terfenol-D and PZT-5H are equal, the optimized length of elastic substrate makes the magnetolectric voltage coefficient of the magnetolectric composite highest, and the resonance frequency of the magnetolectric composite is controllable by changing the length of the elastic substrate. The results are validated by the experiments.

Keywords: magnetolectric composite, elastic substrate, resonance, finite-element analysis

投稿时间: 2010-04-23

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