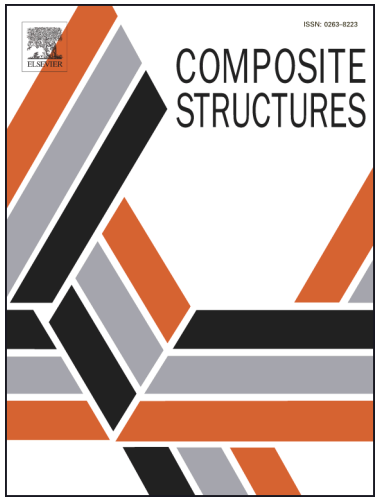

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A numerical efficiency study on the active vibration control for a FGPM beam

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Abstract

Static and dynamic behaviour of a beam made of functionally graded piezoelectric material (FGPM) is studied. The material properties of the PZT4/ aluminium / PZT4 FGPM are graded in the thickness direction according to a fraction volume power law distribution. Top and bottom external surfaces are made of pure PZT4 and the mid plate of pure aluminium. The percolation phenomenon is taken into account. A FGPM beam finite element based on Timoshenko's hypothesis and layerwise approximation is used. In static simulations both actuator and sensor efficiencies are studied. In dynamic simulations active vibration control is performed using a linear quadratic regulator (LQR) method with an observer. Results show the effectiveness of this smart FGPM beam and also the significant effects of the volume fraction index, the percolation threshold and the electrodes' location used for actuation and sensing.

Keywords: Active vibration control, functionally graded piezoelectric material, percolation threshold, FGPM's sensing and actuation capabilities

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