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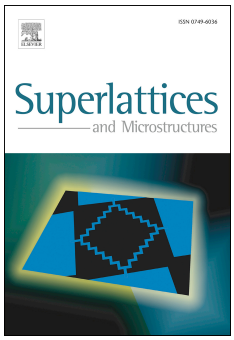

Vibration analysis of functionally graded piezoelectric nanoscale plates by nonlocal elasticity theory: An analytical solution

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Vibration Analysis of Functionally Graded Piezoelectric Nanoscale Plates by Nonlocal Elasticity Theory: An Analytical Solution

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Abstract

This paper investigated the free vibration analysis of functionally graded piezoelectric materials (FGPMs) nanoscale plates based on the Eringen's nonlocal Kirchhoff plate theory under simply supported edge conditions. The material properties vary continuously along the thickness direction based on the power-law distribution in terms of the volume fractions of the constituents. The material compositions are selected from the PZT family. Using Hamilton's principle, the governing differential equations are derived and the Navier's solution is used to attain the natural frequencies. The accuracy of the method is validated by comparing the results with the previous studies. Finally, the effects of the nonlocal parameter, various gradient indexes, mode numbers, aspect ratio and side-to-thickness ratio on natural frequencies are also studied.

Keyword: Free vibration; Nonlocal elasticity theory; Nanoscale plates; Functionally graded piezoelectric material.

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