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Effects of thermal and shear deformation on vibration response of functionally graded thick composite microbeams

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Abstract

In this paper, thermal and shear deformation effects on the vibrational response of **non-homogeneous** microbeams made of functionally graded (FG) materials are carried out. It is assumed that the temperature-dependent material properties of FG microbeams change smoothly and gradually throughout the height according to the classical rule of mixture. The governing differential equations and related boundary conditions are derived by implementing Hamilton's principle on the basis of hyperbolic shear deformation beam and modified couple stress theories and they are analytically solved. The results are given together with other beam theories. A detailed parametric study is performed to indicate the influences of slenderness ratio, material length scale parameter, gradient index, shear correction factors and temperature rise on natural frequencies of FG microbeams. It is revealed that the use of modified shear correction factor can provide more accurate and valid results for first-order shear deformable microbeam model.

Keywords: B. Microstructures; B. Thermomechanical; B. Vibration; C. Analytical modelling

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