

Vibration analysis of multiferroic rectangular plates using higher-order shear deformation theory

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Abstract

We use the first and third-order shear deformation plate theories to analyze free and forced vibrations of simply-supported magneto-electro-elastic rectangular plates. The analytical solution is valid for both thick and thin plates, and for arbitrary variation of material properties in the thickness direction. Frequencies obtained by the present study are proved to be identical with those from the analytical solution of Vel and Batra, which validates our formulation and programming. Parametric studies are completed for varying material gradient profile and length-to-thickness ratios. Forced vibrations of a multiferroic plate with a sinusoidal spacial variation of the pressure applied on its top surface are also discussed.

Keywords: Third-order shear deformation theory, Natural frequencies, Functionally graded plates