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Abstract

A first known free vibration characteristics of functionally graded nanocomposite triangular plates reinforced by single-walled carbon nanotubes (SWCNTs) is presented. The first-order shear deformation theory (FSDT) is employed to account for the effect of transverse shear deformation of the plates and the element-free IMLS-Ritz method is used for numerical computation. The triangular nanocomposite plates are studied with the consideration of different types of distributions of uniaxial aligned SWCNTs. Material properties of the functionally graded carbon nanotube-reinforced composites (FG-CNTRCs) are assumed to be graded through the thickness direction according to linear distributions of the volume fraction of carbon nanotubes. Since no existing results are available for such FG-CNTRC triangular plates, comparisons can only be made with isotropic triangular plates of different angles and thickness-to-width ratios. Stability and accuracy of the present method are demonstrated by convergence studies. New sets of vibration frequency parameters and mode shapes for various FG-CNTRC triangular plates are presented. We have also examined the influence of carbon nanotube volume fraction, plate thickness-to-width ratio, plate aspect ratio, and boundary condition on the plate's vibration behavior. These new results may serve as benchmarks for future studies.

Keywords: Free vibration; triangular plates; functionally graded carbon nanotube-reinforced composites; first-order shear deformation theory; element-free IMLS-Ritz method

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