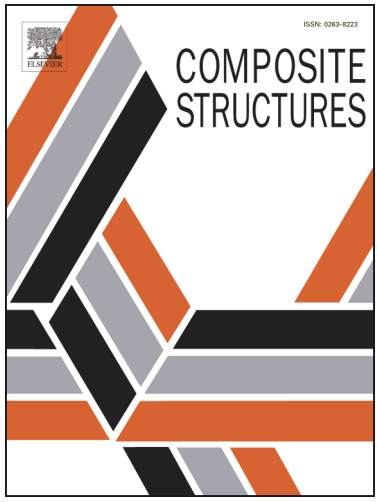

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Effect of thermal gradient load on thermo-elastic vibrational behavior of sandwich plates reinforced by Carbon Nanotube agglomerations

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Abstract

In this study, we investigated the effect of thermal gradient load on natural frequencies of sandwich plates with polymer-based nanocomposite face sheets reinforced by functionally graded (FG) single-walled carbon nanotubes (SWCNTs) agglomerations. Volume fractions and agglomerations of CNTs change across the thickness of each nanocomposite face sheet and temperature-dependent properties of polymer/CNT composite can be estimated with the Eshelby-Mori-Tanaka method. First-order shear deformation theory and a moving least square (MLS) shape function based mesh-free method have also been developed for free vibration and steady state thermal analysis on sandwich plates on two-parameter elastic foundations. We investigated the effects of orientation, aggregation, volume fraction and distribution of CNT. We also studied the effects of essential boundary conditions, sandwich dimensions, and elastic foundation coefficients on frequency behavior of sandwich plates.

Keywords: Thermo-elastic; Free Vibration; Temperature gradient; Sandwich Nanocomposite Plates; Carbon Nanotube agglomeration.

1. INTRODUCTION

Carbon nanotubes are ideal structural components because they have the highest strength and hardness among the materials known to human [1]. Previous research has shown that nanocomposites containing single-walled or multi-walled carbon nanotubes can have high damping capacity due to weak bonding and low interfacial friction between nanotubes and matrix [2]. Kundalwal et al. investigated the effect of carbon nanotubes on the active constrained layer damping of laminated composite shells and plates [3–5]. Suresh Kumar et al. [6] studied the active constrained layer damping of doubly curved sandwich shells

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