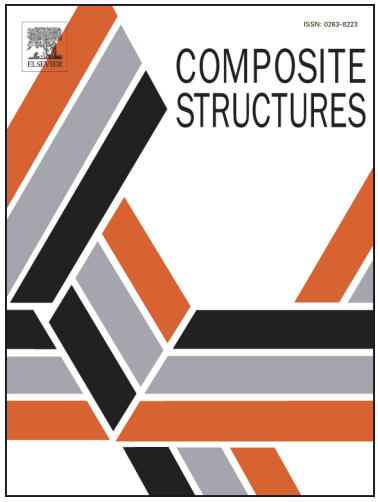

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Nonlinear vibration of sandwich plates with FG-GRC face sheets in thermal environments

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Abstract

Present investigation deals with the nonlinear vibration of a sandwich plate with a homogeneous core and graphene-reinforced composite (GRC) face sheets supported by an elastic foundation under thermal environmental conditions. The material properties of GRC face sheets are assumed to be piece-wise functionally graded by changing the volume fraction of graphene in the thickness direction. The material properties of both the homogeneous core and the GRC face sheets are assumed to be temperature-dependent, and are estimated by the extended Halpin-Tsaia micromechanical model. Reddy's higher order shear deformation plate theory and the von Kármán-type kinematic nonlinearity are used to derive the motion equations which account for the plate-foundation interaction and the thermal effects. The nonlinear vibration solutions for the sandwich plate can be obtained by using a two-step perturbation technique. The effects of distribution type of reinforcements, core-to-face sheet thickness ratio, temperature variation, foundation stiffness and in-plane boundary conditions on the nonlinear vibration characteristics of sandwich plates with piece-wise functionally graded GRC face sheets are discussed in detail.

Keywords: Functionally graded materials; Nanocomposites; Sandwich plate; Nonlinear vibration; Temperature-dependent properties; Elastic foundation

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