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Hui-Shen Shen, Y. Xiang, F. Lin

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**Nonlinear bending of functionally graded graphene-reinforced
composite laminated plates resting on elastic foundations in thermal
environments**

Hui-Shen Shen^{1,*}, Y. Xiang^{2,3}, F. Lin²

¹School of Aeronautics and Astronautics, Shanghai Jiao Tong University, Shanghai 200240,
People's Republic of China

²School of Computing, Engineering and Mathematics and ³Centre for Infrastructure
Engineering, Western Sydney University, Locked Bag 1797, Penrith, NSW 2751, Australia

Abstract

This paper presents an investigation on the nonlinear bending of functionally graded graphene-reinforced composite (FG-GRC) laminated plates resting on an elastic foundation and in a thermal environment. The plate is subjected to a transverse uniform or sinusoidal load combined with initial compressive edge in-plane loads. The plate is made of graphene-reinforced composites which are functionally graded in the thickness direction with a piece-wise type. The material properties of GRCs are estimated through a refined micromechanical model. Governing differential equations for the bending of the FG-GRC plates are based on a higher order shear deformation plate theory and the general von Kármán-type equation and the effects of plate-foundation interaction and temperature variation are taken into consideration. A two-step perturbation technique is employed to determine the load-deflection and load-bending moment curves. The nonlinear bending responses of FG-GRC laminated plates under different sets of loading and thermal environmental conditions are presented and discussed in details.

Keywords: Functionally graded materials; Nanocomposites; Nonlinear bending; Temperature-dependent properties; Pasternak elastic foundation

Corresponding author. E-mail address: hsshens@mail.sjtu.edu.cn (H-S Shen)

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