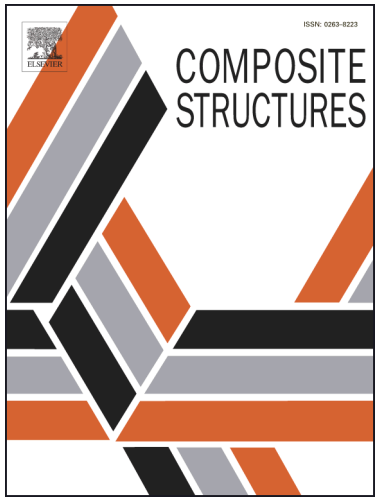

Nonlinear bending of functionally graded graphene-reinforced composite laminated plates resting on elastic foundations in thermal environments

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

PII: S0263-8223(16)32775-1
DOI: http://dx.doi.org/10.1016/j.compstruct.2017.03.001
Reference: COST 8319

To appear in: *Composite Structures*

Received Date: 6 December 2016
Revised Date: 23 February 2017
Accepted Date: 1 March 2017

Please cite this article as: Shen, H-S., Xiang, Y., Lin, F., Nonlinear bending of functionally graded graphene-reinforced composite laminated plates resting on elastic foundations in thermal environments, *Composite Structures* (2017), doi: http://dx.doi.org/10.1016/j.compstruct.2017.03.001

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. Lin[2]

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

[2]School of Computing, Engineering and Mathematics and [3]Centre 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: hsshen@mail.sjtu.edu.cn (H-S Shen)