Accepted Manuscript

Nonlinear vibration of functionally graded graphene-reinforced composite laminated plates in thermal environments

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

PII: S0045-7825(16)31743-1
DOI: http://dx.doi.org/10.1016/j.cma.2017.02.029
Reference: CMA 11356

To appear in: *Comput. Methods Appl. Mech. Engrg.*

Received date : 6 December 2016
Revised date : 10 January 2017
Accepted date : 23 February 2017

Please cite this article as: H. Shen, et al., Nonlinear vibration of functionally graded graphene-reinforced composite laminated plates in thermal environments, *Comput. Methods Appl. Mech. Engrg.* (2017), http://dx.doi.org/10.1016/j.cma.2017.02.029

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Nonlinear vibration of functionally graded graphene-reinforced composite laminated plates 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 deals with the large amplitude vibration of functionally graded graphene-reinforced composite laminated plates resting on an elastic foundation and in thermal environments. The temperature-dependent material properties of piece-wise functionally graded graphene-reinforced composites (FG-GRCs) are assumed to be graded in the thickness direction of a plate, and are estimated through a micromechanical model. Based on a higher-order shear deformation plate theory, the motion equations are developed with geometric nonlinearity taking the form of von Kármán strains. The plate-foundation interaction and thermal effects are also included. The motion equations are then solved by a two-step perturbation technique to determine the nonlinear frequencies of the FG-GRC laminated plates. The numerical illustrations concern the nonlinear vibration characteristics of FG-GRC laminated plates under different sets of thermal environmental conditions, from which results for uniformly distributed GRC laminated plates are obtained as comparators. The effects of distribution type of reinforcements, temperature variation, foundation stiffness and different in-plane boundary conditions are also investigated.

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

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

Download English Version:

https://daneshyari.com/en/article/4964004

Download Persian Version:

https://daneshyari.com/article/4964004

Daneshyari.com