Accepted Manuscript

Nonlinear vibration of compressed and thermally postbuckled nanotube-reinforced composite plates resting on elastic foundations

Hui-Shen Shen, Hai Wang

PII: S1270-9638(16)30396-0
DOI: http://dx.doi.org/10.1016/j.ast.2017.01.017
Reference: AESCTE 3899

To appear in: *Aerospace Science and Technology*

Received date: 7 August 2016
Revised date: 28 December 2016
Accepted date: 19 January 2017

Please cite this article in press as: H.-S. Shen, H. Wang, Nonlinear vibration of compressed and thermally postbuckled nanotube-reinforced composite plates resting on elastic foundations, *Aerosp. Sci. Technol.* (2017), http://dx.doi.org/10.1016/j.ast.2017.01.017

Nonlinear vibration of compressed and thermally postbuckled nanotube-reinforced composite plates resting on elastic foundations

Hui-Shen Shen*, **Hai Wang**

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

Abstract

This paper investigates the small- and large-amplitude vibrations of compressed and thermally postbuckled carbon nanotube-reinforced composite (CNTRC) plates resting on elastic foundations. For the CNTRC plates, uniformly distributed (UD) and functionally graded (FG) reinforcements are considered where the temperature-dependent material properties of CNRTC plates are assumed to be graded in the thickness direction and estimated through a micromechanical model. The motion equations containing plate-foundation interaction are derived based on a higher order shear deformation plate theory and von Kármán nonlinear strain-displacement relationships. The initial deflections caused by compressive or thermal postbuckling are included. The numerical illustrations concern small- and large-amplitude vibration characteristics of compressed postbuckled CNTRC plates in thermal environments and thermally postbuckled CNTRC plates under uniform temperature field. The effects of CNT volume fraction and distribution patterns as well as foundation stiffness on the vibration characteristics of CNTRC plates are examined in detail.

Keywords: Nanocomposites; Functionally graded materials; Temperature-dependent properties; Plates; Vibration

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