Accepted Manuscript

Noncoaxial vibration and buckling analysis of embedded double-walled carbon nanotubes by using doublet mechanics

Ufuk Gul, Metin Aydogdu

PII: S1359-8368(16)33063-3

DOI: 10.1016/j.compositesb.2017.11.005

Reference: JCOMB 5367

To appear in: *Composites Part B*

Received Date: 12 December 2016

Revised Date: 18 September 2017

Accepted Date: 2 November 2017

Please cite this article as: Gul U, Aydogdu M, Noncoaxial vibration and buckling analysis of embedded double-walled carbon nanotubes by using doublet mechanics, *Composites Part B* (2017), doi: 10.1016/j.compositesb.2017.11.005.

NONCOAXIAL VIBRATION AND BUCKLING ANALYSIS OF EMBEDDED DOUBLE-WALLED CARBON NANOTUBES BY USING DOUBLET MECHANICS

Ufuk Gul, Metin Aydogdu*

Department of Mechanical Engineering, Trakya University, 22030, Edirne, TURKEY

Abstract

Free vibration and buckling of double-walled carbon nanotubes embedded in an elastic medium with simply supported boundary conditions are studied. Doublet Mechanics (DM) is used in the analysis. Macro level strain and stresses are defined in terms of micro level strain and stresses in the DM theory. These micro deformations and micro stresses are expanded in Taylor series and the number of terms in the Taylor series defines degree of the approach. Double-walled carbon nanotubes are modelled as Euler-Bernoulli beams embedded in an elastic medium. Critical buckling loads and free vibration frequencies are obtained by using DM and compared with the classical elasticity solutions. It is obtained that for some frequencies carbon nanotubes move noncoaxially. Noncoaxial vibration and buckling affect the physical properties of carbon nanotubes. The present results show that a length scale dependent DM can be used in the design of nano electro-mechanical systems.

Key words: Doublewalled carbon nanotubes, buckling, doublet mechanics, vibration.

*Corresponding author.

E-mail addresses: metina@trakya.edu.tr (M. Aydogdu), ufukgul@trakya.edu.tr (U. Gul).

1. Introduction