Accepted Manuscript

A size-dependent beam model for stability of axially loaded carbon nanotubes surrounded by Pasternak elastic foundation

Bekir Akgöz, Ömer Civalek

PII: S0263-8223(17)31524-6
DOI: http://dx.doi.org/10.1016/j.compstruct.2017.06.039
Reference: COST 8626

To appear in: *Composite Structures*

Received Date: 12 May 2017
Revised Date: 11 June 2017
Accepted Date: 14 June 2017

A size-dependent beam model for stability of axially loaded carbon nanotubes surrounded by Pasternak elastic foundation

Bekir Akgöz[a, 1] and Ömer Civalek[a]

[a]Akdeniz University, Civil Engineering Department,

Division of Mechanics, Antalya-TURKIYE

Abstract

Microstructure-dependent buckling behavior of single-walled carbon nanotubes (SWCNTs) surrounded by a two-parameter elastic foundation is investigated. The governing equations and corresponding boundary conditions in buckling are achieved by implementing minimum total potential energy principle via modified strain gradient theory and several beam theories. The resulting equations are analytically solved by employing Navier's solution procedure for simply supported boundary conditions. A detailed parametric study is performed to indicate effects of diameter-to-length scale parameter ratio, diameter-to-length ratio, shear deformation, shear correction factor and foundation parameters on buckling loads of SWCNTs. Numerical results reveal that the classical buckling loads evaluated by all shear deformation beam theories agree well with each other while a discrepancy occurs between the size-dependent buckling loads of parabolic beam theory (PBT), sinusoidal beam theory (SBT) and Timoshenko beam theory with proposed shear correction factor (TBT*), and those of Timoshenko beam theory (TBT).

Keywords: Size dependency; Carbon nanotube; Non-classical continuum theory; Stability; Sinusoidal beam theory; Pasternak foundation

[1]Corresponding author: Tel: +90-242-3106360; Fax: +90-242-3106306

E-mail address: bekirakgoz@akdeniz.edu.tr