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Selected Publications:

X. Wang, H.K. Yang and K. Dong (Department of Engineering Mechanics, School of Naval Architecture, Ocean and Civil Engineering, Shanghai Jiaotong University, Shanghai 200240, PR China), "Torsional buckling of multi-walled carbon nanotubes", Materials Science and Engineering: A, Vol. 404, Nos. 1-2, September 2005, pp. 314-322, doi:10.1016/j.msea.2005.05.071
ABSTRACT: This paper investigates torsional buckling of an individual multi-walled carbon nanotubes. The multiple shell model is adopted and the effect of van der Waals forces between adjacent nanotubes is taken into account. According to the ratio of radius-to-thickness, multi-walled carbon nanotubes discussed here are classified into three cases: thin, thick, and nearly solid. The critical shear stress and the torsional buckling mode are calculated for various radius-to-thickness ratios. Results carried out show that the buckling mode (m, n) corresponding the critical shear stress is sole, which is obviously different from the axially compressed buckling of an individual multi-walled carbon nanotubes. The investigation on torsional buckling of multi-walled carbon nanotubes in this paper may be used as a useful reference for the designs of nano-oscillators, nano-drive devices and actuators in which multi-walled carbon nanotubes act as basic elements.

Y.J. Lu and X. Wang (Department of Engineering Mechanics, School of Naval Architecture, Ocean and Civil Engineering, Shanghai Jiaotong University, Shanghai 200240, People's Republic of China, email: xwang@sjtu.edu.cn), "Combined torsional buckling of multi-walled carbon nanotubes", J. Phys. D: Appl. Phys. Vol. 39, 2006, p. 3380 doi: 10.1088/0022-3727/39/15/024
ABSTRACT: This paper reports the results of an investigation on combined torsional buckling of an individual multi-walled carbon nanotube (MWNT) under combined torque and axial loading. Here, a multiple shell model is adopted and the effect of van der Waals forces between two adjacent tubes is taken into account. According to the ratio of radius to thickness, MWNTs discussed in this paper are classified into three types: thin, thick and nearly solid. The critical shear stress and the combined buckling mode are calculated for three types of MWNTs under combined torque and axial loading. Results carried out show that the buckling mode (m, n) corresponding to the critical shear stress is unique, which is obviously different from the purely axial compression buckling of an individual MWNT. Numerical results also show that the critical shear stresses and the corresponding buckling modes of MWNTs under combined torque and axial loading are dependent on the axial loading form and the types of MWNTs. The new features and meaningful numerical results in the present work on combined buckling of MWNTs under combined torque and axial loading may be used as a useful reference for the designs of nano-drive devices and rotational actuators in which MWNTs act as basic elements.

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“Buckling of embedded multi-walled carbon nanotubes under combined torsion and axial loading”, International Journal of Solids and Structures, Vol. 44, No. 1, January 2007, pp. 336-351, doi:10.1016/j.ijsolstr.2006.04.031
ABSTRACT: This paper describes an investigation into elastic buckling of an embedded multi-walled carbon nanotube under combined torsion and axial loading, which takes account of the radial constraint from the surrounding elastic medium and van der Waals force between two adjacent tube walls. Depending on the ratio of radius to thickness, the multi-walled carbon nanotubes discussed here are classified as thin, thick, and nearly solid. Critical buckling load with the corresponding mode is obtained for multi-walled carbon nanotubes under combined torsion and axial loading, with various values of the radius to thickness ratio and surrounded with different elastic media. The study indicates that the buckling mode (m, n) of an embedded multi-walled carbon nanotube under combined torsion and axial loading is unique and it is different from that with axial compression only. New features for the buckling of an embedded multi-walled carbon nanotube under combined torsion and axial loading and the meaningful numerical results are useful in the design of nanodrive device, nanotorsional oscillator and rotational actuators, where multi-walled carbon nanotubes act as basic elements.

H.K. Yang and X. Wang (Department of Engineering Mechanics, School of Naval Architecture, Ocean and Civil Engineering, Shanghai Jiaotong University, Shanghai 200240, People’s Republic of China), “Torsional buckling of multi-wall carbon nanotubes embedded in an elastic medium”, Composite Structures, Vol. 77, No.2, January 2007, pp. 182-192, doi:10.1016/j.compstruct.2005.06.013
ABSTRACT: This paper investigates torsional buckling of a multi-wall carbon nanotube embedded in an elastic medium. The effects of surrounding elastic medium and van der Waals forces from adjacent nanotubes are taken into account. Using continuum mechanics, an elastic laminated shell model is presented to study the torsional buckling of a multi-wall carbon nanotube embedded in an elastic medium. A laminated cylinder composed of a multi-wall carbon nanotube and a surrounding elastic medium is used to describe the effect of elastic medium on the multi-wall carbon nanotubes. According to the ratio of radius-to-thickness, multi-wall carbon nanotubes discussed here are classified into three cases: thin, thick, and nearly solid. The critical shear stress and the torsional buckling mode are calculated for various radius-to-thickness ratios and elastic medium effects. Results carried out show that the buckling mode (m, n) corresponding the critical shear stress is sole, which is obviously different from the axially compressed buckling of multi-wall carbon nanotubes. The investigation on torsional buckling of multi-wall carbon nanotubes embedded in an elastic medium in this paper may be used as a useful reference for the designs of nano-oscillators and actuators in which multi-wall carbon nanotubes act as torsional springs.

X.Y. Wang and X. Wang (Department of Engineering Mechanics, School of Naval Architecture Ocean and Civil Engineering, Shanghai Jiaotong University Shanghai 200240, P.R. China, email: xwang@sjtu.edu.cn), “Torsional Buckling of Multi-walled Carbon Nanotubes Subjected to Torsional Loads”, Journal of Reinforced Plastics and Composites, March 2007, vol. 26, no. 5, pp. 479-494, doi: 10.1177/0731684406072538
ABSTRACT: The torsional buckling of an individual multi-walled carbon nanotube under two different loading conditions is studied in this article. The multiple shell model is adopted and the effects of van der Waals forces between adjacent nanotubes are taken into account. An examination with an individual double-walled carbon nanotube shows that the effect of the change of interlayer spacing on the torsional buckling force can be neglected if only the innermost radius is larger than a certain value. Under this condition, single buckling equations are derived and explicit formulas for the critical torsional loads in terms of the buckling modes are obtained. It is found that the critical torsional load of a multi-walled carbon nanotube with torque exerted on the outermost tube is higher than that of the same multi-walled carbon nanotubes under the torques being

proportionally applied to each individual layer of the multi-walled carbon nanotubes. For thin multi-walled carbon nanotubes with large radii, the critical torque linearly scales with its thickness, but the critical shear force (per unit length) of the multi-walled carbon nanotubes uniformly twisted along the cross section does not increase as its layer number (thickness) increases, which is due to the interlayer slips between adjacent nanotubes.