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Abstract

Study of the Behavior of Integrated Boron Nitride Nanotube (BNNTs) under the Effect of a Longitudinal Magnetic Field

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Abstract: In this work, the effect of the longitudinal magnetic field on the mechanical buckling of single-walled boron nitride nanotube (SWBNNT) integrated in the elastic Kerr medium is investigated. The structure is assumed homogeneous and therefore modeled employing the non-local Euler-Bernoulli theory (NL-EBT). The present model targets thin structures and takes into account the small-scale effect. The elastic matrix is described by the Kerr model, which takes into account the normal pressure and the transverse shear strain. Using the nonlocal elastic theory proposed by Eringen and considering the Lorentz magnetic force obtained from Maxwell relations, the stability equation for buckling analysis of a simply supported single-walled boron nitride nanotube under a longitudinal magnetic field is derived. The governing equations of the system were determined via the virtual work model and resolved by Navier's method, and the obtained results are compared with those found in literature. Numerical results enable us to observe the effects of the magnetic field on the behavior of single-walled boron nitride nanotube integrated with the various parameters that are: the non-local parameter, the lower spring parameter Kw, the upper spring parameter Kc and the intermediate shear layer parameter Kg are significant and must be taken into account for this kind of analysis.

Keywords: Kerr's medium; Euler-Bernoulli theory; buckling analysis; carbon nanotube; magnetic field; nonlocal theory

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