

ABSTRACT

Nanotechnology has attracted many researchers and it became popular after the invention of carbon nanotubes. The structural, mechanical, electrical and thermal properties of carbon nanotubes are superior as compared to any other materials. The structural analysis of carbon nanotubes can be performed by experimental, atomic simulation and continuum modeling. Experimental set up is difficult because controlling the parameter at nanoscale is a tough task. The atomic simulation involves atom level to macro level computing and it leads to high cost of the analysis and high performance computing. The continuum modeling is efficient and can be performed with less computing and understanding the physical behaviors in a reliable manner. The classical continuum models fail to predict the behavior of nanostructures with small-size effects because they don't account for atomic level contributions. So the continuum theory with the incorporation of small-size effects becomes necessary to predict the nanostructures behavior. The nonlocal elasticity theory is the effective and reliable theory to account for the small-size effects of nanostructures with reasonable accuracy.

The nonlocal models are developed to analyse the single walled carbon nanotubes, double walled carbon nanorods and double walled carbon nanotubes in the present research investigation. The structural analysis studies like buckling and vibration are studied for the small-size effects. The differential transform method is used for the reliable solution, easy implementation, quick convergence and capable of analysing any boundary conditions to evaluate nonlocal effects on structural response. The shear deformation model of Timoshenko with nonlocal effects are investigated with the nonlocal Euler models. The vibration of nanorod and double walled nanorod are carried out for nonlocal effect. The present research, extended to study the vibration effect of double walled carbon nanotube with various boundary conditions. Further, the nonlocal effects are analysed for double walled carbon nanorods and double walled carbon nanotubes over the frequencies.

The present investigations show that the nonlocal effects significantly affects the small-size structures and it has to be included while analysing nanorods and single walled nanotube and double walled nanotubes.

Keywords: Nanostructures; Carbon nanotubes; Nonlocal elasticity; Elastic medium, DTM