World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:19, No:03, 2025

Nonlinear Nonlocal Torsional Vibration Analysis of Temperature-Dependent Viscoelastic Carbon Nanotubes Embedded in Viscoelastic Medium

Authors : Dilshad Azad Mohammed, Nazhad Ahmed Hussein

Abstract : In this paper, the nonlinear torsional vibration of a viscoelastic single-wall carbon nanotube (SWCNT) embedded in a viscoelastic medium in three-dimensional thermal stresses is investigated. The Kelvin-Viogt relation is used to consider the effect of the viscoelasticity of SWCNTs. The nonlocal theory is used to consider the small-size effect of the SWNCTs. Effect of temperature changes on the mechanical properties of SWCNTs is considered. Hamilton principle is used to obtain boundary conditions and nonlinear nonlocal equation of motion. Then, the multiple scale method is used to solve equation of motion and obtain nonlinear damped nonlocal natural frequencies. Effect of temperature changes, damping and stiffness of viscoelastic medium, and damping and stiffens of viscoelastic SWCNTs on the natural frequencies and torsional vibration response is investigated. The results show all frequencies decrease when the temperature increases.

Keywords : nonlinear torsional vibration, viscoelastic single-wall carbon nanotube, viscoelastic medium, thermal stresses
Conference Title : ICNN 2025 : International Conference on Nanoscience and Nanotechnology
Conference Location : London, United Kingdom
Conference Dates : March 10-11, 2025