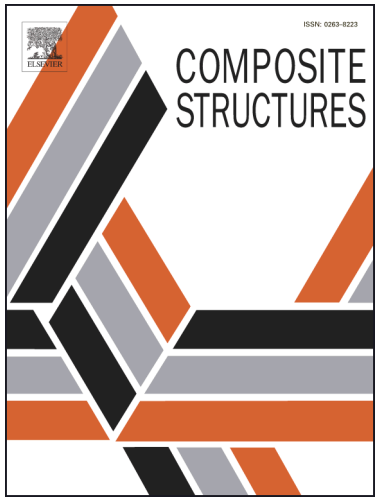

Static analysis of functionally graded nanocomposite sandwich plates reinforced by defected CNT

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Static analysis of functionally graded nanocomposite sandwich plates reinforced by defected CNT

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Abstract

In this paper, stress distribution and deflection in sandwich plates with functionally graded nanocomposite face sheets have been carried out by a first order shear deformation theory (FSDT) based mesh-free method. The sandwich plates are assumed resting on Winkler-Pasternak elastic foundation and the nanocomposite is reinforced by three types of defected carbon nanotubes (CNTs) which are compared with pristine CNT-reinforced nanocomposite. A multiscale modeling with molecular dynamics (MD) simulations in the nanoscale and micromechanical approach of Halpin-Tsai are used to calculate the elastic constants of the nanocomposite. In the mesh-free analysis, moving least squares (MLSs) shape functions are used to approximate displacement field and the transformation method is used for imposition of essential boundary conditions. The effects of Stone-Wales (SW) and vacancy defect configurations of CNTs, number of defects, CNT distribution and volume fraction, boundary conditions and geometric dimensions are investigated on the static analysis of the sandwich plates. It is observed that when CNT volume fraction is 5%, six vacancy defects in CNT configuration can increase the deflection of the sandwich plate up to 41.67%.

Keywords

Static analysis; Defective carbon nanotube; Mesh-free method, Sandwich plates; Molecular dynamic

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