Vibration analysis of size dependent micro FML cylindrical shell reinforced by CNTs based on modified couple stress theory

ABSTRACT

In this manuscript, the sequel of agglomeration on the vibration of fiber metal laminated (FML) cylindrical shell in the micro phase using developed couple stress theory (MCST). Hamilton's principle has been carried out for deriving the non-classical equations of motion of size dependent thin micro cylindrical shell on the basis of Love's first approximation theory. Mori Tanaka and extended rule of mixture are utilized to estimate the mechanical attributes of carbon nanotubes (CNTs) and equivalent fiber, respectively. These four phases CNTs/fiber/polymer/metal laminated (CNTFPML) micro cylindrical shell is analyzed applying beam modal function model for several boundary limitations. Then, an investigation is performed to study the impacts of differing input parameters namely material length scale parameter, agglomeration, the distributions of agglomerated CNTs, the mass fraction of equivalent fiber and the volume fraction of CNTs on the frequency response of micro agglomerated CNTFPML cylindrical shell. The main output illustrated that the growth of frequencies is directly dependent to the increase of material length scale parameter for this agglomerated CNTFPML cylindrical shell so that through increasing the values of agglomeration parameters g and l and material length scale parameter l altogether, the frequencies of this cylindrical shell grow