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Magnetic field effect on thermomechanical buckling and vibration of viscoelastic sandwich nanobeams with CNT reinforced face sheets on a viscoelastic substrate

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Abstract

This article investigates the effect of the magnetic field on the thermomechanical buckling and vibration of viscoelastic sandwich nanobeams in humid environment. The nanoscale beam is composed of a homogeneous core integrated with two functionally graded (FG) carbon nanotube (CNT) reinforced face sheets. The present sandwich nanobeam is subjected to in-plane compressive load as well as in-plane axial magnetic field and embedded in visco-Pasternak substrate that contains Kelvin-Voigt viscoelastic layer and Pasternak shear layer. The motion equations for the deformable sandwich nanobeam are deduced based on a shear and normal deformations beam theory incorporated with the modified couple stress theory that captures the size effect by involving a material length scale parameter. The present results are verified by comparing them with the previously published ones. Moreover, parametric studies have been performed to illustrate the impacts of material parameter, viscoelastic damping for the structure and the foundation, the magnetic field parameter, humidity concentration and other parameters on the buckling load and frequency of the FGCNT reinforced viscoelastic sandwich nanobeams.

Keywords: Functionally graded; Carbon nanotube; Viscoelastic; Sandwich nanobeam; Buckling; Vibration.

1 Introduction

For most engineering applications, the dynamic instability of magneto-elastic structures is considered as one of practical interest with the rapid growth in the advantage of the composite

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