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Vibration Frequency Analysis of Sandwich Nano-Plate on Visco Pasternak Foundation by Using Modified Couple Stress Theory

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Abstract : In this research, the free vibration of a rectangular sandwich nano-plate (SNP) made of three smart layers in the visco Pasternak foundation is studied. The core of the sandwich is a piezo magnetic nano-plate integrated with two layers of piezoelectric materials. First-order shear deformation plate theory is utilized to derive the motion equations by using Hamilton's principle, piezoelectricity, and modified couple stress theory. Elastic medium is modeled by visco Pasternak foundation, where the damping coefficient effect is investigated on the stability of sandwich nano-plate. These equations are solved by the differential quadrature method (DQM), considering different boundary conditions. Results indicate the effect of various parameters such as aspect ratio, thickness ratio, shear correction factor, damping coefficient, and boundary conditions on the dimensionless frequency of sandwich nano-plate. The results are also compared by those available in the literature, and these findings can be used for automotive industry, communications equipment, active noise, stability, and vibration cancellation systems and utilized for designing the magnetostrictive actuator, motor, transducer and sensors in nano and micro smart structures.

Keywords : free vibration, modified couple stress theory, sandwich nano-plate, visco Pasternak foundation
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