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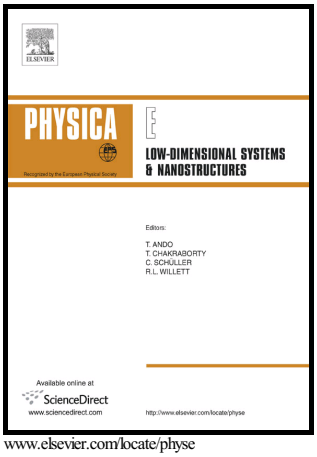

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Free vibration of three-dimensional anisotropic layered composite nanoplates based on modified couple-stress theory

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Abstract

Based on the modified couple-stress theory, three-dimensional analytical solutions of free vibration of a simply supported, multilayered and anisotropic composite nanoplate are derived by solving an eigenvalue system and using the propagator matrix method. By expanding the solutions of the extended displacements in terms of two-dimensional Fourier series, the final governing equations of motion with modified couple-stress effect are reduced to an eigenvalue system of ordinary differential equations. Analytical expressions for the natural frequencies and mode shapes of multilayered anisotropic composite plates with modified couple-stress effect are then derived via the propagator matrix method. Numerical examples are carried out for homogeneous thick-plates and sandwich composite plates to show the effect of the non-local parameter in different layers and stacking sequence on the mode shapes. The present solutions can serve as benchmarks to various thick-plate theories and numerical methods, and could be further useful for designing layered composite structures involving small scale.

Keywords

Modified couple-stress; free vibration; three-dimensional nanoplate; anisotropic layered composite; analytical solution