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Size-dependent behaviour of functionally graded sandwich microplates under mechanical and thermal loads

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Abstract

This paper presents the static bending, free vibration and buckling behaviours of functionally graded sandwich microplates under mechanical and thermal loads. Governing equations of both higher-order shear deformation and quasi-3D theories are derived based on the variational principle and modified couple stress theory. Apart from mechanical load, the temperature profiles considered are either uniform or linear distribution through the thickness, which results in changes of material properties and stress resultants. Numerical results are obtained using Navier solutions. The difference between quasi-3D and 2D models in dealing with mechanical and thermal load is discussed. Temperature-dependent and temperature-independent material properties are examined. The effects of geometry and power-law index together with mechanical loads and various temperature distributions on the size-dependent behaviours of functionally graded sandwich plates are also investigated.

Keywords: Functionally graded plate, sandwich plate, modified couple stress theory, quasi-3D theory.

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