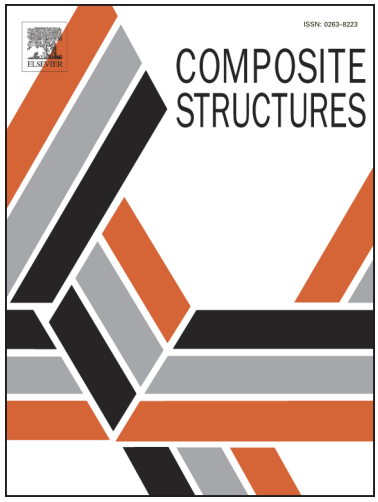

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Buckling and post-buckling analyses of piezoelectric hybrid microplates subject to thermo-electro-mechanical loads based on the modified couple stress theory

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Abstract

In the present paper, the post-buckling behavior of a simply supported piezoelectric hybrid microplate subject to thermal, electrical and mechanical loads is studied. The size effect in the mechanical behavior of the microplate is captured by using the modified couple stress theory. The Mindlin plate theory is adopted to describe its deflection behavior with the von Karman's geometric nonlinearity taken into account. Based on these assumptions and the principle of minimum potential energy, the equilibrium equations of the microplate and associated boundary conditions are derived. By applying the Galerkin method to the equilibrium equations, closed-form solutions for the critical thermal/mechanical buckling load and the load-displacement relation in the post-buckling stage are obtained. Furthermore, the effects of the material length scale parameter to thickness ratio, the applied electric field and in-plane boundary conditions on the buckling and post-buckling behavior of the piezoelectric hybrid microplate are discussed in detail.

Keywords

Buckling; Post-buckling; Piezoelectric hybrid microplate; Modified couple stress theory; Galerkin method

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