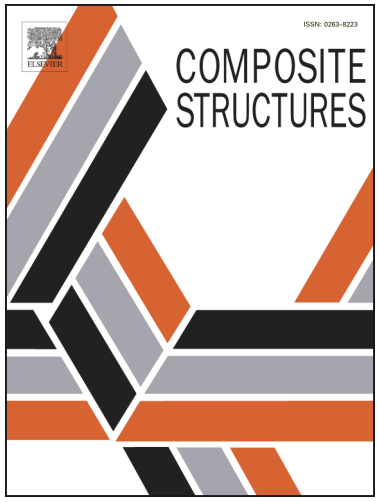


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# Thermal-mechanical-electrical buckling behavior of functionally graded micro-beams based on modified couple stress theory

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Abstract: This paper presents thermal-mechanical-electrical buckling analysis of micro-beams that are made of functionally graded materials(FGMs) with temperature-dependent thermo-elastic properties. The material properties of the micro-beam are assumed to be graded in the thickness direction according to a simple power law distribution in terms of the volume fractions of the constituents. The governing equations are based on the principle of the minimum total potential energy, von Kármán geometric nonlinearity theory, and modified couple stress theory is employed to consider the size effect. A differential quadrature (DQ) method combined with an iteration process is used to predict the critical buckling external axial force and buckling temperature increment. The effects of the volume fraction profile parameter, dimensionless length scale parameter, initial gap ratio, ground electrode shape parameter, the applied voltage, slenderness ratio and the axial residual stress on the thermal-mechanical-electrical buckling behavior are evaluated in detail through parametric studies.

Keywords: Functionally graded materials; Micro-beam; Size effect; Thermal-mechanical-electrical buckling

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