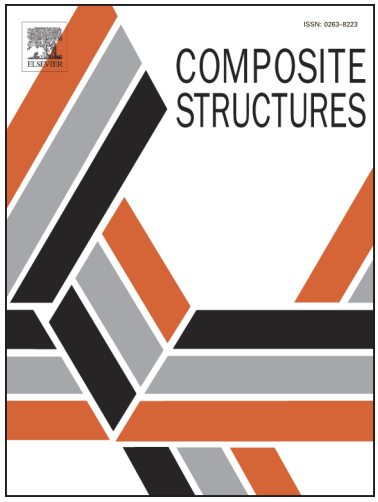

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Nonlinear buckling of functionally graded nano-/ micro-scaled porous beams

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Abstract

Functionally graded materials (FGMs) and porous materials are two special and new branches of materials with unique applications and properties. Emerging nano-/micro-science is growing every day and for this purpose, FGMs and porous materials can be used in small-scale systems. In this study, the nonlinear buckling characteristics of functionally graded nano-/micro-beams which are made of porous materials are studied based on Euler-Bernoulli beam theory for the first time. Considering the von Kármán geometric nonlinearity, governing equations of nano-beam are derived using Eringen's nonlocal theory and the modified couple stress theory is utilized to obtain the governing equations of microbeam. The generalized differential quadrature method (GDQM) is used along with the iteration technique to obtain the nonlinear results. The results are depicted to show the effects of different parameters on the nonlinear buckling behavior of the functionally graded (FG) porous micro-/nano-beams for clamped boundary condition.

Keywords:

Nonlinear Buckling; Functionally graded; Porous materials; Eringen's theory; Modified couple stress theory; GDQM.