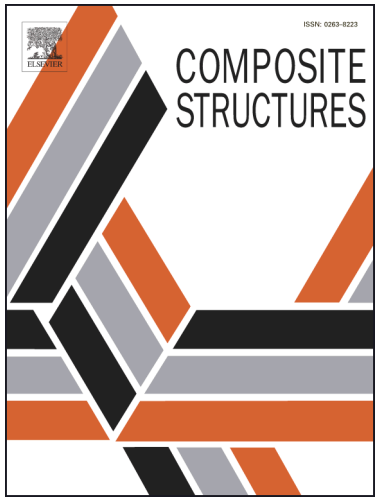

Investigating post-buckling of geometrically imperfect metal foam nanobeams with symmetric and asymmetric porosity distributions

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Investigating post-buckling of geometrically imperfect metal foam nanobeams with symmetric and asymmetric porosity distributions

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Abstract

In this research, analysis of post-buckling behavior of porous metal foam nanobeams is performed based on a nonlocal nonlinear refined shear deformation beam model with geometric nonlinearity and imperfection. In the metal foam nanobeam, porosities are dispersed by uniform, symmetric and asymmetric models. The present nanobeam model satisfies the shear deformation effect needless of any shear correction factor. The post-buckling load-deflection relation is obtained by solving the governing equations having cubic nonlinearity applying Galerkin's method needless of any iteration process. New results show the importance of porosity coefficient, porosity distribution, geometrical imperfection, nonlocal parameter, foundation parameters and slenderness ratio on nonlinear buckling behavior of porous nanoscale beams. Specially, porosities have a great impact on post-buckling configuration of both ideal and imperfect nanobeams.

Keywords: Post-buckling, Refined beam theory, Porous nanobeam, Nonlocal elasticity, Porosities

1. Introduction

Porous materials, such as metal foams, are an important category of lightweight materials with application to aerospace engineering, automotive industry and civil constructions owning to supreme multi-functionality offered by low specific weight, efficient capacity of energy dissipation and enhanced machinability. Usually, the variation of porosity through the thickness