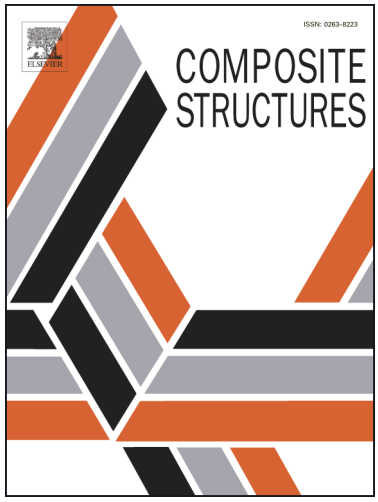

A study on the vibrational properties of weight-efficient plates made of material with functionally graded porosity

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A study on the vibrational properties of weight-efficient plates made of material with functionally graded porosity

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Abstract

Functionally graded (FG) porous structures are a novel class of weight-efficient engineering materials and characterized by introducing graded non-uniform porosities. Due to the wide range of applications of porous materials in lightweight structures, biomedical systems and separation processes, in this paper, three-dimensional (3D) free vibration analyses of light-weight plates made of uniform and non-uniform graded porous materials resting on two-parameter elastic foundations are investigated. The mathematical formulation is based on linear and small strain elasticity assumptions. The plate with FG porosity is simply supported at the edges and is assumed to have three variations of porosities through the thickness. A semi-analytical approach composed of differential quadrature method (DQM) and series solution is adopted to solve the equations of motion. Validation and convergence studies are also done to demonstrate the accuracy of the results. The natural frequencies of the simply-supported plate made of material with functionally graded porosity are calculated and presented in both tabular and graphical forms. The effects of different porosity distributions, porosity parameter, elastic coefficients of

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