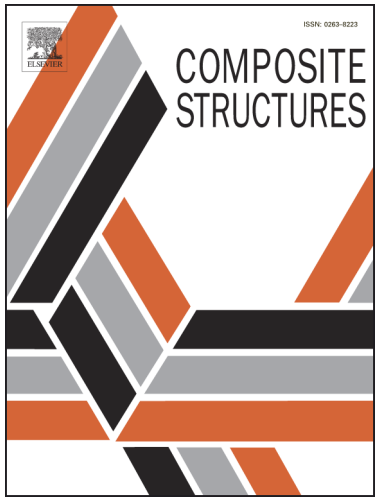

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Buckling of Timoshenko Beams Composed of Two-Dimensional Functionally Graded Material (2D-FGM) Having Different Boundary Conditions

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Abstract

In the present paper, two-dimensional functionally graded materials (2D-FGMs) are presented for the first time to investigate the buckling of beams with different boundary conditions. It is assumed that the material properties of the beam vary in both axial and thickness directions according to the power-law form. Basis on the Timoshenko beam theory (TBT), the critical buckling load of 2D-FG beams is obtained using the Ritz method. In order to obtain buckling load, the trial functions for axial, transverse deflections and rotation of the cross-sections are expressed in polynomial forms. Clamped-clamped (CC), Clamped-simple (CS), simple-simple (SS) and Clamped-Free (CF) boundary conditions are considered. The boundary conditions are satisfied by adding auxiliary functions to the displacement functions. At the same time, buckling load of 2D-FG beam is calculated for Euler-Bernoulli beam theory for comparison purposes. Some numerical results are provided to examine the effects of the material gradation, shear deformation (or aspect ratio) and different boundary conditions on the buckling behavior of 2D-FG beams.

Keywords: Buckling; Two-dimensional functionally graded material (2D-FGM); Timoshenko beam theory, Ritz method

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