

Effect of the micromechanical models on the bending of FGM beam using a new hyperbolic shear deformation theory

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Abstract. In this paper, a new refined hyperbolic shear deformation beam theory for the bending analysis of functionally graded beam is presented. The theory accounts for hyperbolic distribution of the transverse shear strains and satisfies the zero traction boundary conditions on the surfaces of the functionally graded beam without using shear correction factors. In addition, the effect of different micromechanical models on the bending response of these beams is studied. Various micromechanical models are used to evaluate the mechanical characteristics of the FG beams whose properties vary continuously across the thickness according to a simple power law. Based on the present theory, the equilibrium equations are derived from the principle of virtual work. Navier type solution method was used to obtain displacement and stresses, and the numerical results are compared with those available in the literature. A detailed parametric study is presented to show the effect of different micromechanical models on the flexural response of a simply supported FG beams.

Keywords: FG Beams, Micromechanical models, Bending, Navier solution