Analysis of Free Vibration of Sandwich BeamsConsider Normal Deformation Effect

R. Bennai, H. Ait Atmane

Abstract : A new refined hyperbolic shear and normaldeformation beam theory is developed to study the free vibrationof functionally graded (FG) sandwich beams under variousboundary conditions.The effects of transverse shear strains as well as the transversenormal strain are taken into account. Material properties of thesandwich beam faces are assumed to be graded in the thicknessdirection according to a simple power-law distribution in termsof the volume fractions of the constituents. The core layer is stillhomogeneous and made of an isotropic material. Equations ofmotion are derived from Hamiltons principle.Analytical solutions for the bending, free vibration andbuckling analyses are obtained for simply supported sandwichbeams. Illustrative examples are given to show the effects ofvarying gradients, thickness stretching, boundary conditions, andthickness to length ratios on the bending, free vibration offunctionally graded sandwich beams.

Keywords : refined shear deformation theory, Stretching effect, free vibration, boundary conditions., functionally graded sandwich beam