عنوان مقاله:

Free Vibration of Functionally Graded Epoxy/Clay Nanocomposite Beams based on the First Order Shear Deformation Theory

نویسنده:

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خلاصه مقاله:

This paper deals with free vibration of epoxy/clay nanocomposite beams for functionally graded and uniformly distributed of Nanoclay with simply supported conditions at both ends. The specimens were prepared for uniformly distributed of Nanoclay with different Nanoparticles weight percent (pure, 3 wt%, 5 wt% and 7 wt%) and functionally graded distribution. To apply the model of theoretical predictions for the Young modulus, the genetic algorithm procedure was employed for functionally graded and uniformly distributed epoxy/clay nanocomposites and then were compared with the experimental tensile results. The formulation for Young modulus includes the effect of nanoparticles weight fractions and it is modified for functionally graded distribution to take into account the Young modulus as a function of the thickness coordinate. The displacement field of the beam is assumed based on the first order shear deformation beam theory. Applying the Hamilton principle, the governing equations are derived. The influence of nanoparticles on the free vibration frequencies of a beam is presented. To investigate the accuracy of the present analysis, a compression study is carried out with the experimental free vibration results. The results have shown that there is high accuracy for the genetic algorithm procedure for theoretical predictions of the Young modulus and the free vibration frequencies for uniform distribution are generally lower than the corresponding value of the functionally graded distribution.

کلمات کلیدی:

First Order Shear Deformation Theory, Free vibration, Functionally Graded Nanocomposite, Genetic Algorithm Theory

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