عنوان مقاله:

Free vibration and wave propagation of thick plates using the generalized nonlocal strain gradient theory

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خلاصه مقاله:

In this paper, a size-dependent first-order shear deformation plate model is formulated in the framework of the higher-order generalized nonlocal strain-gradient (GNSG) theory. This model employs two nonlocal parameters and a strain-gradient coefficient to capture the both higher-order nonlocal stress-gradient and straingradient effects in nanostructures. The presence of these different scale parameters renders a unified model, which is able to predict both increase and reduction of stiffness in nanoplates. The governing equations are developed for free vibration of first-order shear deformation plates using Ritz method. The dispersion relations for the GNSG plate model is also derived. Several numerical examplesare studied to show the efficiency, competence and accuracy of the proposed model. To ensure the applicability of the presented GNSGplate model, the results are compared with the experimental data available in the scientific literature. It is found that the effects ofscale parameters on the wave frequencies are significant at high wavenumbers and ratio of any pair of these parameters is the maincriterion for the correct study of size effects. The results show that the reduced nonlocal strain-gradient (RNSG) model and the GNSGmodel diverge in higher vibration modes

کلمات کلیدی:

Free vibration, First-order shear deformation plate, Wave propagation, Higher-order nonlocal straingradient model, Ritz method, Wave

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