

### عنوان مقاله:

Application of Halpin-Tsai Method in Modelling and Sizedependent Vibration Analysis of CNTs/fiber/polymer Composite Microplates

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#### خلاصه مقاله:

In the present study, modelling and vibration analysis of Carbon nanotubes/ fiber/ polymer composite microplates are investigated. The governing equations of the Carbon nanotubes/ fiber/ polymer composite microplates are derived based on first order shear deformation plate theory, rather than other plate theories, due to accuracy and simplicity of polynomial functions. The modified couple stress theory is employed because of its capability to interpret the size effect. Halpin-Tsai model is utilized to evaluate the material properties of two-phase composite consisted of uniformly distributed and randomly oriented Carbon nanotubes through the epoxy resin matrix. Afterwards, the structural properties of carbon nanotubes reinforced polymer matrix, which is assumed as a new matrix, and then, reinforced with E-Glass fiber, they are calculated by fiber micromechanics approach. Employing Hamilton's principle, the equations of motion are obtained and solved by Hybrid analytical numerical method. The influences of various parameters such as the weight percentage of single-walled carbon nanotube, aspect ratio, and size effect on the vibration characteristics of microplate are discussed in details. Results indicate that the stability of Carbon nanotubes/fiber/polymer composite microplates can be improved by adding appropriate values of Carbon nanotubes. In addition, increase in the frequencies is more pronounced in the case of microplates reinforced with SWCNT . These findings can be used in design and manufacturing of marine vessels and aircrafts

### كلمات كليدى:

Halpin-Tsai model, modified couple stress theory, multiscale composite plate, vibration analysis

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