**Free Vibration and Buckling Analyses of Functionally Graded Plates Reinforced by Graphene Platelets**

Sunchhorng Roun1, Van-Loi Nguyen2 and Jaroon Rungamornrat1,\*

*1 Center of Excellence in Applied Mechanics and Structures, Department of Civil Engineering, Chulalongkorn University, Bangkok 10330, Thailand*

*2 Department of Strength of Materials, Hanoi University of Civil Engineering, Hanoi, Vietnam*

*\*Corresponding author: jaroon.r@chula.ac.th*

**Abstract.** A new nanocomposite is proposed and evaluated via the free vibration and buckling analyses of plate structures. These nanocomposite plates are manufactured by incorporating graphene platelets (GPLs) into a conventional functionally graded matrix, with the aim of enhancing their overall stiffness. In the present study, the matrix phase is graded along the thickness direction according to the power-law distribution of the constituents, whereas various GPL dispersion patterns along the thickness direction are considered. Based on the novel four-unknown refined plate theory and Hamilton’s principle, the governing equations of motion of the plate are developed. The Navier-type solution scheme is then adopted to obtain the natural frequency and critical buckling load of the nanocomposite plate. Finally, a selected set of results is reported to evaluate the performance of this novel nanocomposite model.

**Keywords:** Free vibration, Buckling, Functionally graded plates, Graphene platelets, Four-unknown refined theory.