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Numerical Investigation of Free Vibration of FG-GPLRC Porous Cylindrical Panels

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ABSTRACT

Graphene platelets (GPLs) have been widely used as an advanced nanofiller to improve the physical properties of composites due to their extraordinary physical properties. The porous composite materials reinforced with GPLs in which both internal pores and GPLs are functionally distributed through the structure's thickness are called functionally graded GPL-reinforced composite (FG-GPLRC) porous structures. The purpose of this study is to investigate the free vibration of FG-CNTRC porous cylindrical shell panels by developing a 2-D effective and locking-free meshfree-based numerical method. The free vibration problem was formulated using the first-order shear deformation shell theory in the framework of the 2-D natural element method (NEM). The effective material properties of the GPL-reinforced shell panel were evaluated by employing the Halpin.Tsai model and the rule of mixtures and were modified by considering the porosity distribution. The numerical method was validated through benchmark experiments, and the free vibration characteristics of FG-GPLRC porous cylindrical shell panels were parametrically investigated.

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