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ABSTRACT

This paper investigates the eigenvalue buckling of functionally graded graphene platelets (GPLs) reinforced cylindrical shells consisting of multiple layers through finite element method (FEM). The mechanical properties of the composites, including Young's modulus, mass density and Poisson's ratio, are determined by modified Halpin-Tsai model and rule of mixture. Parametric study is conducted to investigate the effects of the weight fraction, geometry and distribution of GPLs, number of layers, shell dimensions and existence of cutout on the buckling. The results show that apart from concentration the GPL distribution in polymer matrix significantly influences the buckling behaviors of the cylindrical structures. Larger sized GPLs with fewer graphene layers have better reinforcing effects than their counterparts with smaller surface area and more graphene layers. The distribution of stresses along the thickness of the shells suggests the increase of the number of layers significantly decreases the stress gradient between two neighboring layers, which is beneficial to reduce the risk of delamination. Moreover, the effects of cutout imperfection on the buckling behaviors of the cylindrical shells are comprehensively investigated.

Keywords**:** Elastic Buckling; Cylindrical Shells; Functionally Graded Material; Graphene Platelets

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