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Analytical solution for buckling of orthotropic double-layered graphene sheets exposed to unidirectional in-plane magnetic field with various boundary conditions

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Abstract:

In this article, the analyses of the buckling behaviour of orthotropic double-layered graphene sheets (DLGSs), resting on Pasternak's elastic foundation with various boundary conditions and subjected to unidirectional in-plane magnetic field are presented. The governing equations of equilibrium of the nonlocal model are derived in terms of generalized displacement using the new first-order shear deformation theory (NFSDT) and Maxwell's equations in conjunction with the Eringen's differential nonlocal elastic law. An explicit solution for buckling loads is obtained for orthotropic DLGSs under biaxial and uniaxial loads. The effectiveness of the present formulation and solutions are firstly validated by executing the comparison studies with results available in the literature. The effects of nonlocal parameter, magnetic field strength, a different type of load and boundary conditions, aspect ratio, side length and number of half waves on the buckling behaviour of DLGSs are investigated.

Keywords: A. Nano-structures, B. Buckling C. Analytical modelling, Magnetic field

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