عنوان مقاله:

A Non-linear Static Equivalent Model for Multi-layer Annular/Circular Graphene Sheet Based on Non-local Elasticity Theory Considering Third Order Shear Deformation Theory in Thermal Environment

محل انتشار:

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نویسندگان:

S. Dastjerdi - *Department of Mechanical Engineering, Mashhad Branch, Islamic Azad University, Mashhad, Iran*

M. Jabbarzadeh - *Department of Mechanical Engineering, Mashhad Branch, Islamic Azad University, Mashhad, Iran*

خلاصه مقاله:

In this paper, it is tried to find an approximate single layer equivalent for multi-layer graphene sheets based on third order non-local elasticity theory. The plates are embedded in two parameter Winkler-Pasternak elastic foundation, and also the thermal effects are considered. A uniform transverse load is imposed on the plates. Applying the non-local theory of Eringen based on third order shear deformation theory and considering the van der Waals interaction between the layers, the governing equations are derived for a multi-layer graphene sheet. The governing equations for single layer graphene sheet are obtained by eliminating the van der Waals interaction. In this study, two different methods are applied to solve the governing equations. First, the results are obtained applying the differential quadrature method (DQM), which is a numerical method, and then a new semi-analytical polynomial method (SAPM) is presented. The results from DQM and SAPM are compared and it is concluded that the SAPM results are satisfactorily accurate in comparison with DQM. Since analyzing a multi-layer graphene sheet needs a time-consuming computational process, it is investigated to find an appropriate thickness for a single layer sheet to equalize the maximum deflections of multi-layer and single layer sheets. It is concluded that by considering a constant value of the van der Waal interaction between the layers, the maximum deflections of multi and single layer sheets are equal in a specific thickness of the single layer sheet

کلمات کلیدی:

Single and Multi-layer Graphene SheetNon-local Elasticity Theory of EringenDifferential Quadrature Method (DQM)Semi-analytical Polynomial Method (SAPM)Winkler-pasternak Elastic FoundationThermal Environment