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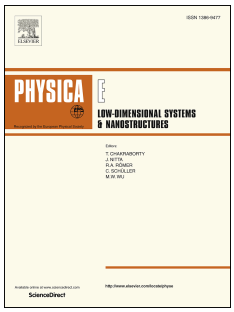

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Investigation both actions of elastic foundation parameters and small scale effect on axisymmetric bending of annular single-layered graphene sheet resting on an elastic medium

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Abstract

Many different researches show that stiffness of nanoplates or nanosheets and other nanostructures are decreased by existing or increasing the small scale effect. But few studies that applied other models or approaches to get relationships between stiffness of nano/microstructures and the small scale effect are found results contrary to the results of the above mentioned researches. In this paper, axisymmetric bending behavior of the annular single-layered graphene sheet resting on an elastic medium is studied by comparing results of the nonlocal elasticity and classical theories. The Pasternak-type foundation model is employed to simulate the interaction between the graphene sheet and the surrounding elastic medium. To get numerical results, the Ritz method is applied. Also, an aspect ratio is defined, and a parametric study is carried out varying the small scale parameter, elastic foundation parameters and the mentioned aspect ratio of the annular graphene sheet .The applied nonlocal elasticity model to analyze annular graphene sheet resting on an elastic medium is an exact nonlocal stress gradient model which have presented correct results in cases of with and without the elastic medium and whose results are in accord with experimental researches, studies based on other continuum approaches and some molecular dynamics simulations. Results of present paper represent that increase of the small scale effect increases the stiffness of nanostructures. For the first time, it is also shown that the mentioned result is in agreement with experimental researches, other continuum approaches, and some molecular dynamics simulations studies. Also, the simultaneous effects of all the mentioned parameters on the stiffness of nanostructures are investigated.

Keywords: nonlocal elasticity theory; Ritz method; small scale effect; elastic medium; annular single-layered graphene sheet; Pasternak model.