

## عنوان مقاله:

Stress Concentration Factor of Single-Layered Graphene Sheets Containing Elliptical Vacancies

محل انتشار:

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## خلاصه مقاله:

In the present study, potential of finite element based molecular structural mechanics (MSM) for evaluating stress concentration factor of single-layered graphene sheets (SLGSs) with elliptical vacancies is successfully addressed. The MSM approach mimics the interatomic forces of the nanostructure by defining an equivalent frame structure containing beam elements. To obtain the mechanical and cross sectional properties of the equivalent beam, the potential energies of chemical bonds between carbon atoms in the hexagonal lattice of SLGSs are equaled to the strain energies of the beams. This novel proposed approach accurately predicts the stress concentration in graphene sheets with significantly less computational effort in comparison to computational physics methods. Both armchair and zigzag configurations are considered. Furthermore, a comparison between the results obtained by presented MSM approach and theory of elasticity for thin infinite panels having elliptical holes is presented. Influence of chirality, and geometry of elliptical vacancies are investigated in details. Results reveal that MSM approach can successfully predicts stress concentration factor phenomena in nano structures, especially SLGSs. It is seen that chirality has a significant effect on the stress concentration factor so that armchair SLGSs show a larger value of stress .concentration

## کلمات کلیدی:

Defected grapheme, Elliptical vacancies, Molecular structural mechanics, Stress Concentration Factor, Finite Element Method

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