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Magnetic Field Effects on Parabolic Graphene Quantum Dots with Topological Defects

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Abstract : In this paper, we investigate the low-lying energy levels of the two-dimensional parabolic graphene quantum dots (GQDs) in the presence of topological defects with long range Coulomb impurity and subjected to an external uniform magnetic field. The low-lying energy levels of the system are obtained within the framework of the perturbation theory. We theoretically demonstrate that a valley splitting can be controlled by geometrical parameters of the graphene quantum dots and/or by tuning a uniform magnetic field, as well as topological defects. It is found that, for parabolic graphene dots, the valley splitting occurs due to the introduction of spatial confinement. The corresponding splitting is enhanced by the introduction of a uniform magnetic field and it increases by increasing the angle of the cone in subcritical regime.

Keywords : coulomb impurity, graphene cones, graphene quantum dots, topological defects
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