Magnetic and transport properties of hexagonal graphene nanomeshes

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Graphene nanomeshes are the nanostructures consisting of graphene flake with a regular pattern of antidots (holes) punched through it. Nanomesh-based transistors has been shown to offer improved I_{on}/I_{off} ratio of the collector current while supporting up to 100 larger driving currents that nanoribbon-based devices. In this paper we studied the electronic structure and magnetic and transport properties of graphene nanomeshes with hexagonally shaped antidots using denisty functional tight binding (DFTB) method. It has been found that the internal zigzag edges support magnetic moments and that lowest energy magnetic configuration is antiferromagnetic. The density of states (DOS) calculated for ground state configuration demonstrate the existence of the energy gap which furthermore can be substantially reduced upon switching (*e.g.* by external magnetic field) to ferromagnetic configuration. Based on this we predict that the structure will exhibit magnetoresistive effect, which makes graphene nanomeshes of this kind relevant for spintronic applications. The conclussions are further supported by transport calculations.