Service de Physique de l'Etat Condensé

Séminaire SPEC

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SPEC Salle Itzykson, Bât.774, Orme des Merisiers

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Electronic properties of graphene antidot lattices

We study graphene antidot lattices - triangular superlattices of voids in a graphene sheet, displaying a direct band gap whose magnitude can be controlled via the antidot size and density. We show that, due to their bipartite structure, such lattices display completely dispersionless (flat) bands at zero-energy (Fermi level). For representative graphene antidot lattices, we predict the real-space electron density profiles corresponding to such bands. We also investigate the effect of phonons in these superlattices using a model that accounts for the phonon-modulation of electronic hopping integrals (i.e., Peierls-type electron-phonon coupling). Based on the adopted model, we quantify the nature of charge carriers by computing the conduction-band quasiparticle weight due to the electron-phonon coupling. We find a strong phonon-induced renormalization, which provides an indication of polaronic behavior and points to the necessity of taking into account inelastic degrees of freedom in future studies of transport in graphene antidot lattices.

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