Transport phenomena in nanostructured graphene

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In order to realize many of the promises that graphene may fulfill, the pristine sheet must be modfied so as to display a band gap, at least in certain regions in space. This can be achieved, e.g., by a selective adsorption of adatoms, by cutting the graphene sheet into a nanoribbon, or by applying a transverse electric field to a bilayer graphene. Here we describe yet another route: a regular perforation of the graphene sheet, dubbed as graphene antidot lattice (GAL). Our group developed this idea in 2008 [1], and since then many groups have followed route, either independently, or by using the concepts we introduced. We describe the basic theoretical ideas, review the experimental situation and some aspects of the rapidly growing theoretical literature, and report on our recent simulations of charge and thermal transport in finite GALs [2]. We also address how very large systems of nanostructured graphene may be amenable to simulations using first-principles input [3].

References

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