Excitons in Armchair Graphene Nanoribbons

I.Naghmouchi[2], S. Jaziri[1,2]
[1] Laboratoire de Physique de la Matière condensée, Faculté des Sciences de Tunis, Tunisia.
[2]Laboratoire de Physique des Matériaux, Faculté des Sciences de Bizerte, 7021 Jarzouna, Tunisia.

Keywords: graphene, armchair nanoribbon, exciton

Graphene armchair ribbons have several special properties that are well suited for optic applications, when a gap exists in the energy spectrum. The energy gap arising in a graphene nanoribbon makes it possible to generate excitons by optical excitation or electron-hole injection. Confined excitons strongly affect optical properties of the system. We have investigated, using effective mass approach, excitonic properties of armchair graphene nanoribbons when the electrons and holes of occupy only the lowest conduction and valence subbands. We find that excitonic properties, binding energy and oscillator strength depend sensitively on the width of the ribbon. we have performed a detailed first-principles study of the effects of self-energy and electron-hole interaction in the optical response. Because of reduced dimensionality, excitonic effects are dominant in the optical spectrum. In addition, dark excitons are found, and this is also of importance to the photophysics of these materials.