

Zigzag-edged interfaces between C and BN nanosheets

Miguel Pruneda

Centro de Investigación en Nanociencia y Nanotecnología (CIN2-CSIC), Campus UAB, Barcelona, Spain

miguel.pruneda@cin2.es

A number of new physical phenomena have been discovered in the last few years at the interfaces between very different materials. The electronic reconstruction induced at these boundaries can give rise to metallic states [1], magnetism [2], or even superconductivity [3], although the parent compounds were originally insulating oxides. But not only boundaries of bulk materials are important: in two dimensional graphene nanoribbons (GNR), edges have become relevant [4]. Here I will present new striking phenomena induced at the 1D interfaces of bidimensional heterostructures made of semimetallic graphene and insulating BN nanosheets that may become experimentally available soon [5]. First-principles density functional calculations of these hybrid C/BN systems show that the magnetic character of the edge states in zigzag shaped GNR and the polar BN edge team up to give a spin asymmetric screening that induces half-semimetallicity at the interface, with a gap of a few tenths of eV for one spin orientation and a tiny gap of hundredths of eV for the other [6]. It will be shown that these effects can also be observed in tubular geometries with zigzag edges between C and BN domains. The role of point defects close to the interface and the vibrational properties of these heterostructures will be discussed.

References

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Figures

