Recent results on electronic properties of graphene

A. Harju[1]

[1]Aalto University, Helsinki, Finland

This talks present some new results on interesting electronic properties of graphene. In the first direction, the collective electronic states are shown to exhibit interesting many-particle interference of the Fabry-Perot type [1] that differ from the more traditional single-particle Fabry-Perot experiments. The measurements are done on suspended graphene samples and the reflection is caused by the connections to leads. Theoretical modeling for these can be done on the tight-binding level that reliably models the collective states in graphene structures [2] and electronic transport properties [3,4]. The second direction deals with well-defined graphene nanostructures on gold substrate, where finite ribbons interact more weakly than, e.g., on iridium [2]. The STM/STS experiments are used to probe the electronic structures both with metallic and CO tip, and theoretical work is based on tight-binding, density functional theory, and exact diagonalizations using a new re alistic model for long-range interacting graphene. We show some evidence for magnetic zigzag edge state and study the effects of structural defects on electronic and magnetic properties.

[1] P. Hakonen et al., (collaboration).
[2] S. Hämäläinen et al., *Phys. Rev. Lett.* **107**, 236803 (2011).
[3] A. Uppstu et al., *Phys. Rev. B* **85**, 041401(R) (2012).
[4] A. Uppstu and A. Harju, *Phys. Rev. B* (accepted).
[5] P. Liljeroth, D. Vanmaekelbergh et al., (collaboration).
[6] N. B. Kopnin et al., (http://arxiv.org/abs/1210.7595).