

Seminář odd. 26

Tenkých vrstev a nanostruktur

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TÉMA

Understanding the electronic and transport properties of graphene nanostructures

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Confined graphene nanostructures are of obvious importance for the development of graphene-based electronics. Moreover, they show distinct properties, e.g. energy band gaps, localized states and intrinsic magnetic moments, induced by the electron confinement at edge boundaries. Atomically precise graphene nanostructures can be produced on surfaces using different techniques, such as chemical vapor deposition (CVD) or on-surface synthesis.

In this talk, I will present combined theoretical and experimental studies of various graphene nanostructures on different metallic surfaces. Our investigations demonstrate that their properties will strongly depend on the growth method, on the underlying substrate and on the chosen molecular precursor.

For instance, our work on CVD-grown graphene nanoislands on Ni(111) has demonstrated a strong spin dependent electron scattering at the graphene edges, as well as the key role of the graphene-metal interaction on the edge conformation and on the shape of the nanostructure.[1,2]

In the case of on-surface synthesized graphene nanoribbons, we have shown that either straight or chiral structures can be grown on different substrates by just slightly modifying the molecular precursor.[3] Besides, for nanoribbons grown on Au(111), the insertion of a pair of boron atoms in the interior of the ribbon backbone has been found to produce very efficient confining barriers for electrons, leading to quantum well states in their valence band. [4]

[1] A. Garcia-Lekue et al., Phys. Rev. Lett. 112, 066802 (2014)

[2] A. Garcia-Lekue et al., J. Phys. Chem. C 119, 4072 (2015)

[3] D. G. de Oteyza et al., ACS Nano 10, 9000 (2016)

[4] E. Carbonell-Sanromà et al., Nano Letters 17, 50 (2017)