ELECTRONIC STRUCTURE AND MANY BODY EFFECTS IN GRAPHENE STUDIED BY ANGLE-RESOLVED PHOTOEMISSION

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The talk will deal with a detailed analysis of the electronic structure of graphene using angle-resolved photoelectron spectroscopy. Experiments are performed using epitaxial graphene on the silicon face of SiC(0001), grown on the $6\sqrt{3} \times 6\sqrt{3}$ R30° carbon buffer layer, on hydrogenintercalated graphene, and on graphene grown on metals. Particular emphasis will be put on an interpretation of the spectral function near the Fermi level and the Dirac point, in terms of many-body processes such as electron-phonon, electron-electron and electron-plasmon coupling. In studying electron-phonon coupling, a difference between single and bilayer graphene explains the difference in friction between these two systems as observed in friction force microscopy [1]. The decoupling of graphene from the substrate through intercalated hydrogen permits the observation of a new quasiparticle [2], i.e. a coupled hole-plasmon mode predicted by Lundqvist in 1967. Small amounts of adsorbed hydrogen are shown to induce a metal-insulator transition at very low (~1% of a monolayer) coverages, and are assigned to defect-induced localization processes [3]. Graphene grown on ferromagnetic surfaces, suggested to be suitable for an application as spin filter, exhibit an induced magnetic on the carbon atoms as revealed by x-ray magnetic circular dichroism [4]. These experimental studies demonstrate that, on account of its true 2D nature, graphene is an ideal material to investigate many-body physics and low dimensional electronic structure in general.

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References

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