MA 41: Focus Session "Spins in Organic Materials II" (jointly with DS)

Time: Wednesday 15:45–16:45 Location: GER 37

Topical Talk MA 41.1 Wed 15:45 GER 37

Organic spintronics and the great potential of ferromagnetic metal-organic interfaces — •Martin Aeschlimann — Department of Physics, University of Kaiserslautern

The study of the spin properties of organic semiconductors (OSC) is recently receiving great attention. One of the most promising routes to employ them for spintronics applications is to exploit the high spin injection achievable across ferromagnetic metal-organic interfaces [1]. Combined with the extreme flexibility and tunability of OSC, it is expected that such hybrid interfaces will constitute a fundamental building block for advanced spintronics devices, where spin-injection is controlled by fine-tuning of the interface physical and chemical properties. An example has been recently presented in [2], where doping of the OSC copper phthalocyanine (CuPc) has been successfully used to tune the spin functionality of a cobalt-CuPc interface. In particular, the presence of a spin-polarized hybrid interface state, acting as a spin-filter at the interface, has been used to enhance the efficiency of spin injection to values above 100%. Besides the cobalt-CuPc interface, we have studied the iron-CuPc, cobalt-Tris(8-hydroxyquinolinato)aluminium (Alq3) and iron-Alq3 interfaces. The studies have been conducted by means of spin polarized scanning tunnelling microscopy and spectroscopy, spin-resolved ultraviolet photoemission spectroscopy and spin- and time-resolved two-photon photoemission.

[1] M. Cinchetti et al., Nature Materials 8, 115-119 (2009)
[2] M. Cinchetti et al., Phys. Rev. Lett. 104, 217602 (2010)

MA 41.2 Wed 16:15 GER 37

Investigation of the chemical and electronic structure of CoPc from monolayer to thick films by photoemission spectroscopy — •Uwe Treske, Mandy Grobosch, Feng Zhu, and Martin Knupfer — IFW - Dresden

In this work monolayers and multilayers of cobalt(II)phthalocyanine (CoPc) were analysed with respect to their chemical and electronical properties. The organic material was deposited under ultra high vacuum conditions on single crystalline Au(100) (5×20 reconstruction) and Ag(111) surfaces that were cleaned by Ar^+ bombardment and annealing cycles. The molecular ordering has been studied by low energy electron diffraction (LEED) and the morphology of thick films by scanning probe microscopy (AFM) that indicates a polycristalline growth.

The results of combined X-ray and ultraviolet photoemission spectroscopy (XPS, UPS) indicate clear differences in the valence band and Co2*p* core level spectra for mono- and multilayer due to charge transfer to the monolayer cobalt ion and a possible influence of image charge screening effects enhanced by the metal substrates. An additional interface state in the vicinity of the Fermi level was observed in the monolayer spectra.

MA 41.3 Wed 16:30 GER 37

Cobalt-Meq$_3$ (Me=Al, In, Ga) interface formation studied by spin- and time-resolved photoemission spectroscopy — •Nicolas Grossmann, Sabine Steil, Martin Laux, Andreas Ruffing, Indranil Sarkar, Mirko Cinchetti, and Martin Aeschlimann — Department of Physics and Research Center OPTIMAS, University of Kaiserslautern, 67663 Kaiserslautern, Germany

We have studied the formation of the interface between an epitaxially grown Co(001) thin film and the organic semiconductors tris(8-hydroxyquinoline)aluminium(III) (Alq$_3$), tris(8-hydroxyquinoline)gallium(III)(Gaq$_3$) and tris(8-hydroxyquinoline) indium(III)(Inq$_3$). The organic semiconductors were progressively grown on the cobalt substrate up to a coverage of 5 monolayers. The grown interfaces have been characterized by means of spin-resolved ultraviolet photoemission spectroscopy and spin- and time-resolved two-photon photoemission spectroscopy. For every growth step we have monitored the changes in the work function, the energetic position of the occupied and unoccupied molecular orbitals and interface states, and the changes in the cobalt spin polarization induced by interface formation. In addition, we have measured the spin-resolved lifetime of unoccupied hybrid interface states. The results will be discussed with focus on the relevance of spin-polarized hybrid interface states on the sign of the magnetoresistance observed in organic spin valves based on Alq$_3$ [1].

[1] V. A. Dediu, et al., Nature Mater. 8, 707 (2009);