Study of In-$CuPcF_4$ nanocomposite by millisecond dynamic XPS and traditional PES and TEM

O. V. Molodtsova[1], D. V. Potorochin[1,2], S. V. Babenkov[1,3], S. L. Molodtsov[2,4], A. A. Makarova[5], D. A. Smirnov[6], and V. Yu. Aristov[1]

[1]*Deutsches Elektronen-Synchrotron DESY, 22607 Hamburg, Germany*
[2]*TU Bergakademie Freiberg, D-09599 Freiberg, Germany*
[3]*CEA-Saclay, 91190 Gif-sur-Yvette, France*
[4]*Europian XFEL GmbH, D-22869 Schenefeld, Germany*
[5]*Institute of Chemistry and Biochemistry, Free University of Berlin, D-14195 Berlin, Germany*
[6]*Institut für Festkörper- und Materialphysik, Technische Universität Dresden, 01062 Dresden, Germany*
Email address of corresponding author: olga.molodtsova@desy.de

The emergence and development of molecular electronics have drawn particular attention to molecular semiconductors, such as metal phthalocyanines. They have unique properties and are technologically advanced in the production of films. Using ultrathin films as a matrix, it is possible to create organometallic composites containing metal nanoparticles self-assembled in an organic matrix. The technologies for creating the described nanocomposites are quite simple and relatively cheap; therefore, such materials can take a prominent place in practical use in various electronic devices. However, despite the growing interest in hybrid systems, numerous questions about their properties and the processes that occur during their formation still remain unanswered. For example, interfacial phenomena can radically change the electronic properties of organic wide-gap matrices. It should also be noted that the processes of formation of organometallic interfaces in the manufacture of hybrid organo-inorganic systems proceed quickly. Therefore, the recording of experimental data in a dynamic mode could reveal additional properties of these materials that are important for electronics. Thus, Figure 1 shows the evolution of the spectra of core levels C 1s, N 1s, and In 3d 5/2, recorded directly during the deposition of indium on the CuPcF4 surface under ultrahigh vacuum conditions. A detailed description of the experiments can be found in [1, 2].

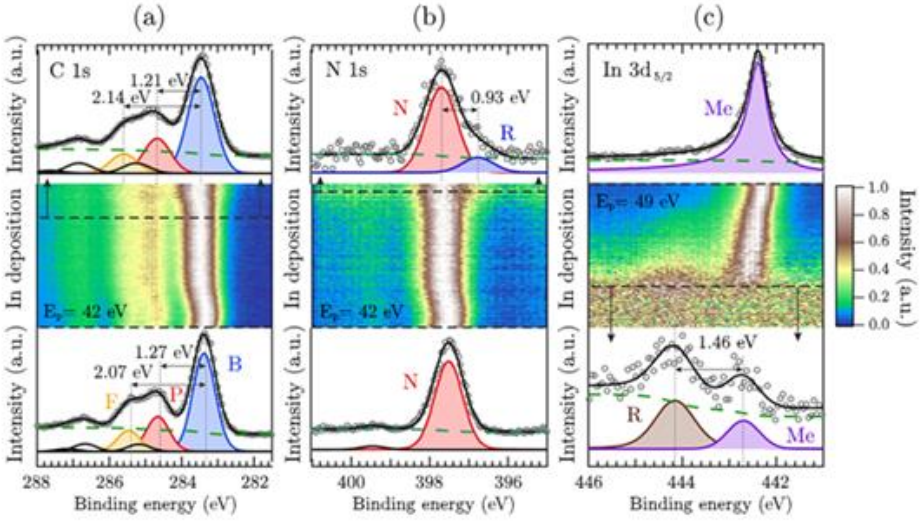

Fig. 1. Evolution of the spectra of core levels (a) C 1s, (b) N 1s, and (c) In 3d $_{5/2}$ recorded in the millisecond interval directly during the deposition of indium on the CuPcF4 surface under ultrahigh vacuum conditions.

[1] O. V. Molodtsova *et al.*, Appl. Surf. Sci., **546**, 149136 (11) (2021)
[2] V. Yu. Aristov *et al.*, J. Surf. Invest.: X-Ray, Synchrotron Neutron Tech., **15** (6) 1129-1132 (2021)