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Deposition of silver, indium, and magnesium onto organic semiconductor layers: Reactivity, indiffusion and metal morphology

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Abstract

Novel devices based on organic semiconductors such as organic light emitting diodes or organic field effect transistors require metallic contacts. Therefore, the interface between metals and organic semiconductors deserves special attention. In situ Raman scattering was applied here to assess metal/organic interface formation. As model systems molecular layers of two perylene derivatives, viz. 3,4,9,10-perylene-tetracarboxylic dianhydride (PTCDA) and *N*,*N*′-dimethyl 3,4,9,10-perylene-tetracarboxylic diimide (DiMe-PTCDI) were investigated. These layers were grown on S-GaAs(1 0 0) substrates by organic molecular beam deposition in ultra-high vacuum. Ag, In, and Mg were thermally evaporated onto the organic layers and the Raman spectra were recorded in situ. The results reveal that Ag and Mg form an abrupt interface while In strongly diffuses into the organic layers. Mg, on the other hand, undergoes strong chemical reaction with PTCDA. The experiments also benefit from a strong enhancement of the scattering intensity which is induced by the rough morphology of deposited metals. The enhancement factors as a function of nominal metal coverage and the subsequent attenuation at large metal coverages deliver valuable information on the metal morphology which is discussed in comparison to additional atomic force microscopy results.

Keywords: PTCDA; DiMe-PTCDI; Metals, Raman spectroscopy

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