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Raman monitoring of In and Ag growth on PTCDA and DiMe-PTCDI thin films

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Abstract

The formation of In and Ag interfaces with 3,4,9,10-perylene tetracarboxylic dianhydride (PTCDA) and *N*,*N*′-dimethyl-3,4,9,10-perylene tetracarboxylic diimide (DiMe-PTCDI) was investigated by in situ Raman spectroscopy in order to determine the interaction between the metals and the organic molecules. A significant enhancement of internal vibrational modes is observed in all cases, clearly indicating the presence of surface enhanced Raman scattering. The molecules having direct contact with the metal are involved in a weak ground state dynamical charge transfer resulting in a breakdown of selection rules. However, there is no indication for the formation of new chemical bonds. In the case of In deposition on PTCDA, this contradicts previous models of covalent bond formation between In and O atoms in PTCDA. The enhancement factors of the Raman signals can be employed to extract information on indiffusion and morphology of the metals. Both metals exhibit rough morphologies of different degrees and depending on the organic substrate. In addition, In shows the strongest tendency of indiffusion when deposited on PTCDA. This is corroborated by the rapid disappearance of intermolecular, i.e. phonon-like modes in the frequency range below 120 cm^{-1}.

Author Keywords: Organic films; PTCDA; DiMe-PTCDI; SERS

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