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Surface enhanced Raman spectroscopic studies of the metal-semiconductor interface in organic field effect transistors[1] DANISH ADIL, SUCHI GUHA, Departemnt of Physics and Astronomy, University of Missouri, Columbia, MO 65211 — The performance of organic field-effect transistors (FETs) largely depends on the nature of interfaces of dissimilar materials. Metal-semiconductor interfaces, in particular, play a critical role in the charge injection process. Here, Raman spectroscopy is used to investigate the nature of the Au-semiconductor interface in pentacene based FETs. A large enhancement in the Raman intensity (SERS) is observed from the pentacene film under the Au layer. The enhancement is evidence of a nano-scale roughness in the morphology of the interface, which is further confirmed by electron microscopy images. The morphology of the interface is investigated by SERS as a function of the pentacene layer thickness and the Au layer thickness. The Raman spectra are found to be extremely sensitive in detecting small changes in the morphology of the interface in the sub-nanometer range. Changes in the Raman spectra are further tracked after biasing and ageing the devices. Evolution of these Raman spectra is correlated with degradation in device performance. Finally, FETs based on other donor-acceptor semiconductors are probed by Raman scattering and contrasted with those of the pentacene-based devices.

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