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Direct observation of pentacene-thiol interaction using x-ray spectroscopy ZHANG JIA, Columbia University, VINCENT LEE, LUCA FLOREANO, ALBERTO VERDINI, ALBANO COSSARO, ALBERTO MORGANTE, IOANNIS KYMISSIS, COLUMBIA UNIVERSITY TEAM, CNR-INFM LABORATORIO NAZIONALE ITALY COLLABORATION — There has been an intense interest in the surface modification of the source-drain electrodes for organic field effect transistors (OFETs) to improve their performance. A number of thiol based self assembled monolayers demonstrated improvements to the contact resistance and channel performance. Morphological improvements at the contacts, a change in the effective work function, and charge transfer between the thiols and the semiconductor have all been credited with the observed performance improvements. Using in-situ semiconductor deposition together with x-ray photoelectron spectroscopy and near-edge x-ray absorption fine structure, we are able to directly probe two technologically relevant OFET stacks. This work directly measures the interaction between pentacene and two thiols which have been associated to contact improvement: an electroneutral thiol (1-hexadecanethiol) and an electronegative thiol (pentafluorobenzenethiol). Based on our results we observe no chemical interaction between pentacene and the thiol. The electrical improvements to transistor performance, based on these systems, can be attributed to work function shifts of the contacts and morphological improvements of the organic semiconductor.

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