

H₂O Induced Structural Modification of Pentacene Crystal

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Atmospheric H₂O has been known as one of the obstacles for prolonged life time of organic devices. Pentacene have been widely studied as a model system of simple organic based field effect transistors (OFETs). Here, we show the evolution of the electronic and geometric structure of the pentacene crystal driven by the adsorption of H₂O molecules. Core level, valence band, and x-ray absorption spectra support that H₂O molecules physisorb on the pentacene surface, which form a strong dipole layer which increases the ionization energy by about 0.5 eV. It reflects the increase of hole injection barrier. In addition, we made another discovery that the crystallinity of the pentacene layer is deteriorated by the diffused H₂O molecules, which reflect the weakening intermolecular interactions of pentacene crystal.