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Initial to multilayer growth transition of diF-TES-ADT[1]

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The importance of the non-covalent Fluorine-Sulfur and Fluorine-Fluorine interactions in driving 2D molecule self-assembly will be discussed in terms of organic semiconductor design. Observed structures and crystal growth of 2,8-difluoro-5,11-triethylsilylethynyl anthradithiophene (diF-TES-ADT) are put in context of bulk measurements and device performance measurements. Scanning Tunneling Microscopy studies of the growth of diF-TES-ADT on Au(111) from the submonolayer to several molecular layer regime were undertaken to elucidate the macroscopic growth of diF-TES-ADT on Au contacts. Two crystal structures are observed, both displaying diF TESADT backbone planes parallel to the substrate. Submolecular resolution imaging of the first monolayer ordered film regions realizes structures with close approach of Fluorine-Sulfur and Fluorine-Fluorine atoms of alternating molecules. Scanning Tunneling Spectroscopy measurements indicate a transport gap of 2.4 eV which is insensitive to local domain. After a disordered second layer growth, the third molecular layer displays excellent crystallinity with multiple domains. The fourth molecular layer mimics the third, indicating a transition to bulk crystal formation. These measurements are related to very recent device data and put in context of other growth studies.

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