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Inter-Chain Interactions in Arrays of Metal-Organic Hybrid Chains on Ag(111)

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Fabrications of metal-organic hybrid networks attracted much attention due to possible applications in gas storages, heterogeneous catalyses, information storages, and opto-electronic devices. One way to construct three-dimensional hybrid structures is to make the arrays of planar or linear metal-organic hybrid structures which are linked through electrostatic interactions. As a model study, we fabricated the arrays of one-dimensional hybrid chains and investigated inter-chain interactions between adjacent hybrid chains using scanning tunneling microscopy (STM) and spectroscopy (STS) on Ag(111). Brominated anthracene molecules were used to grow the arrays of hybrid chains on Ag(111). We proposed atomic models for the observed structures. Linear chains are made of repetition of Ag-anthracene units. Br atoms are attached to anthracene molecules through Br-H structures which mediate inter-chain interactions. Two different apparent heights were observed in anthracene molecules. Molecules having a Br-H connection look brighter than those with two connections due to electronic effect. When a chain is laterally manipulated with STM tip, Br atoms move together with the chain implying that Br-H inter-chain interactions are quite strong.

Keywords: Molecular chain, Scanning Tunneling Microscope, Metal-ligands interaction