Tunable Nearly-Freestanding Supramolecular Assembly

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Supramolecular structures can be finely tuned by choosing a proper combination of molecular building blocks once the binding mechanism is determined. This scenario is particularly interesting when the substrate weakly interacts with the molecular species giving the possibility to form 2D nearly free-standing phases. Our aim is to depict the driving forces behind the formation of these structures especially in the case of molecular self-assembly through non-covalent interactions. We present a scanning tunnelling microscopy (STM) study on the unconventional packing of 4-Decyloxy Benzoic Acid (4DBA) molecule on Au (111) surface. The STM mapping is combined with density functional theory (DFT) calculation and photoemission spectroscopy tools to describe the complex molecular adsorption geometry, in which molecules lie flat on the herringbone reconstructed surface. Interestingly, the nearly free-standing behavior of the supramolecular layer is recovered regardless of the alkyl chain length of the benzoic acid-based molecules.