Engineering of the Static Interface Dipole in Metal/Organic Nanohybrid Materials

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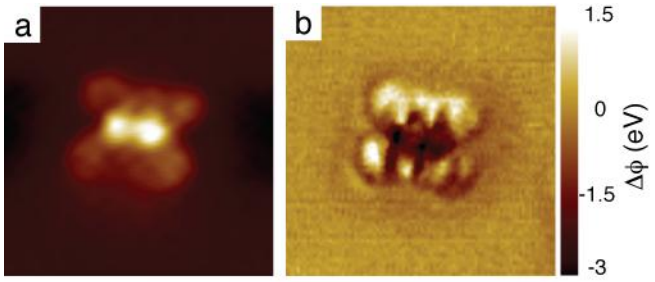
The surface dipole at the interface between organic and metallic nanomaterials is a key parameter for the properties of organics-metal hybrid materials. It determines the spin-dependent charge transfer at the interfaces between metals and organics, and such critical for the performance of sensors and organic spintronics devices. In this project, we will explore avenues to engineer the surface dipole in metal-organic hybrid nanostructures. We will study families of molecules with large intrinsic electrical dipole that are intrinsically good organic conductors, self-assemble well on metallic surfaces, and have enough flexibility in their design to allow many variations in pending or functional groups. Hallmarks of this project are the imaging and spectroscopy with ultimate atomic resolution and prototype device fabrication, resulting in fundamental understanding and mastering of the metal-organic interface.



Scanning tunneling microscopy image of a single tetraphenyl porphyrin molecule on a Cu(111) surface (a). The charge transfer between the molecule and the metal modifies the surface dipole of the Cu surface strongly and locally, observable as local increase and decrease of the work function, ϕ (b).