Switching and electronic properties of switchable azobenzene derivatives on HOPG

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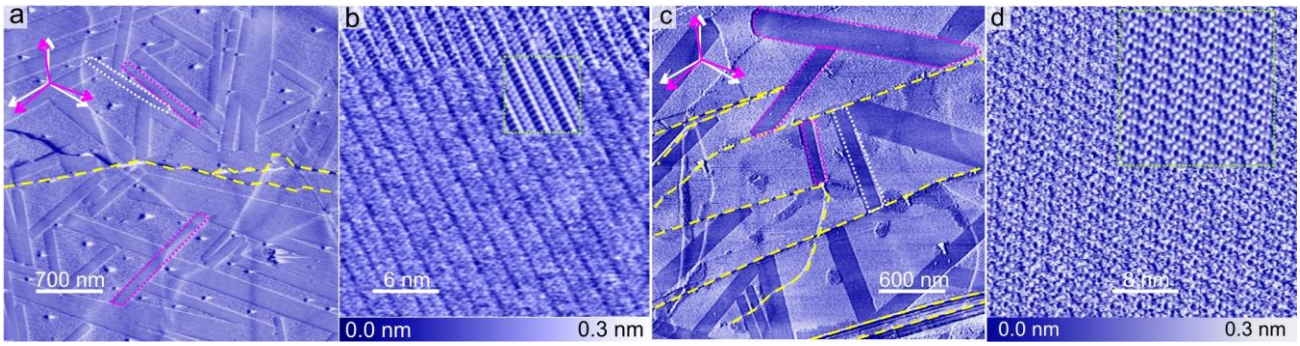
Azobenzene (AB) derivatives have a unique ability to undergo reversible –trans and –cis geometrical isomerization upon illumination with light. The switching is also associated with a change in electronic property, which makes these molecules a possible candidate for opto-electronic devices. Fabrication of thin films of these molecules on surfaces would be necessary for production of devices. Hence, molecular assembly and the microscopic patterns of these photo switchable molecules over surfaces have imparted significant role in molecular electronics. Many AB derivatives have revealed molecular level switching on surfaces. Surface-based switching of these derivatives is different from switching in gas and solution phase. The switching of AB derivatives on surfaces can be triggered through tunneling electrons, UV light, electric field, etc[1-5]. Scanning probe microscopic (SPM) techniques have played a powerful role in obtaining atomic level understanding of the molecular self-assembly, growth pattern and controlled geometries within the assembly. We have investigated the microscopic structure of AB derivatives functionalized with –COOH group over HOPG (0001). We have prepared ultra-thin films of these photo-switchable molecules at ambient condition by drop-casting method. The growth of these AB derivatives at molecular level is comprehended using STM and the global behavior of growth is investigated using AFM at ambient conditions. Figure shows AFM phase (a, c) and STM topography (b, d) images of 4-(Phenylazo) benzoic acid (a, b) and 4-[2-(1,3,5-Trimethyl-1H-pyrazol-4-yl) diazenyl] benzoic acid (c, d). The microscopic analysis reveals a dimer based assembly of both molecules through –COOH dimeric hydrogen bonding interaction. At global level the ultra-thin films reveal highly crystalline islands (magenta and white dashed lines in a and c) of molecules, which are aligned with the graphite lattice directions (indicated using magenta and white arrows). The electronic properties of the molecules within the assembly are understood using Scanning Tunneling Spectroscopy (STS).



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