

## **Influence of supramolecular order details on the properties of SAM-functionalized surfaces**

*Carmen Ocal*

*Institut de Ciència de Materials de Barcelona (ICMAB-CSIC)*

*Bellaterra 08193-Barcelona, Spain*

After a short technical description of an experimental strategy based on the use of several scanning probe microscopy techniques, its application to a specific organic self-assembled monolayer system will be presented. The influence of the supramolecular order within the organic film on the local surface properties will be investigated thanks to the capability of preparing coexisting arrangements formed out of the same molecular unit.

Different supramolecular arrangements of *w*-(4'-methylbiphenyl-4-yl) butanethiol  $\text{CH}_3(\text{C}_6\text{H}_4)_2(\text{CH}_2)_4\text{SH}$  (BP4) molecules can spontaneously form on Au(111). Under optimal preparation conditions, the coexistence of these phases can be achieved to fabricate an ideal scenario for our purposes. Using different Scanning Probe Microscopy (SPM) methods we correlate and in-situ compare the structure of each molecular phase with their mechanical (Friction Force Microscopy, FFM), conductive (Conducting Scanning Force Microscopy, CSFM) and electrostatic (Kelvin Probe Force Microscopy, KPFM) responses.

Several motivations are at the basis of our approach since performances of any nanotechnological device involving organic junctions, in particular sensors and bioelectronic devices, which do obviously benefit from the knowledge of the organic film properties. For instance, in general, friction coefficients of surfaces are highly dependent of structural details down to the nanoscale. The organic system presented here will permit observing and understanding concepts as friction anisotropy and friction asymmetry, both of them related to the dependence of friction with the sliding direction. On the other hand, the efficiency of organic electronic devices clearly depends on the capability of modifying the electrodes' work function as to obtain the correct alignment of their Fermi-level and the corresponding molecular orbitals of the organic semiconductors. Molecules with convenient surface-molecule dipole are commonly chosen for correcting metal work functions in order to control the injection barrier height between metal and semiconductor. Our system will serve to show how small differences in the molecular tilt and packing adopted by the same molecule can be enough to contribute to such work function correction.

In summary, well designed and sensitive SPM measurements provide information as detailed as molecular tilt angles and/or tilt angle azimuths in an organic film, the consequent different molecular dipoles influence the work function of the metallic substrate as well as the transport mechanism operating in the junction.