

Stable Organic Radicals On Metal Substrates Studied by Scanning Tunneling Microscopy

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Adsorption of stable organic radicals on metal surfaces changes their electronic properties on a wide scale. Thorough preparation of samples with submonolayer coverages makes it possible to study single adsorbed molecules with an unpaired electronic spin [5], as well as smaller molecular clusters with interesting topographic properties and possible mechanical degrees of freedom [4]. At this conference I will present scanning tunneling microscopy (STM) studies of α , γ -bis(diphenylene)- β -phenylallyl (BDPA) [1,2] and 2,2-diphenyl-1-picrylhydrazyl (DPPH) [3], two well-known stable organic radicals, adsorbed on Au(111) and Ag(111) surfaces.

Our STM studies of BDPA on Au(111) [1,2] provide strong indications of spin preservation upon adsorption due to the presence of a Kondo resonance close to the Fermi level. It was also shown that BDPA forms self-aligned directed one-dimensional chains of various length. Nearly identical chains were observed in our recent experiments with BDPA on Ag(111). The presence of a Kondo resonance in the point scanning tunneling spectra (STS) taken from BDPA on the Ag(111) surface has not yet been directly observed and so the question of spin preservation of BDPA on this metal surface remains open. Electronic structure simulations show that BDPA interacts stronger with silver than with gold, giving a possible explanation of the differences in the BDPA's electronic properties in these two cases.

DPPH is another showcase of a magnetic single-spin system made up of a molecule adsorbed on a metal surface. We reported on the Kondo resonance in the characteristic STS spectra of this system in our recent study [3].

Magnetic molecular systems such as BDPA and DPPH radicals adsorbed on Au(111) surface play a pivotal role in investigation of single-molecule spin transitions by means of our novel experimental technique: radio frequency scanning tunneling spectroscopy (RF-STS).

References:

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