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DISTINGUISHED LECTURE SERIES

Summer Term 2021

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Spin-state switching of iron complexes adsorbed on surfaces

The Fe(II) spin-crossover molecules (SCMs) [Fe(bpz)2(bipy)] and [Fe(bpz)2(phen)] (bpz = dihydrobis(pyrazolyl)borate) could be deposited on various substrates from the gas phase, leading to the first high-quality films of Fe(II) SCMs that exhibit both thermal spin crossover (SCO) and light-induced excited spin state trapping (LIESST).[1] Ultrathin (~7 nm) films of [Fe(bpz)2(phen)] on Au(111) were investigated using valence-band photoemission spectroscopy (UPS). LIESST as well as vacuum UV-induced excited spin state trapping (VUVIESST) were observed.[2]. By thermal evaporation also mono- and submonolayers of [Fe(bpz)2(phen)] could be prepared. Through high-resolution STM applied at 5 K reversible electron-induced excited spin state trapping (ELIESST) was induced in single SCMs on Au(111).[3] Submono- and monolayers of [Fe(bpz)2(phen)] on highly oriented pyrolytic graphite (HOPG) could be spin-switched by light with high efficiency, as evidenced by NEXAFS and XMCD.[4]

In order to evaluate the influence of cooperative effects on the spin-switching properties of surface-adsorbed SCMs, [Fe(bpz)2(bipy)] was deposited on HOPG and investigated with x-ray absorption spectroscopy.[5] Molecules within submonolayers exhibit an apparent anticooperative behavior, which is also reflected by HS → LS decay curves deviating from monoexponential behaviour. On increasing the coverage, the width of the temperature-induced spin transition curve narrows significantly, evidencing the buildup of cooperative effects.

As Fe(II) SCMs supported by bidentate ligands disintegrate in the first layer on Au(111), more robust, vacuum-evaporable Fe(II) complexes supported by tridentate ligands have been developed.[6] Recent results regarding the spin-state switching of these 2nd generation SCMs on surfaces are reported.

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Date: **Monday, June 21, 2021**
Time: **04:00 pm**
Venue: **Online via Zoom (Webinar ID: TBD)**