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Innsbruck Physics Colloquium

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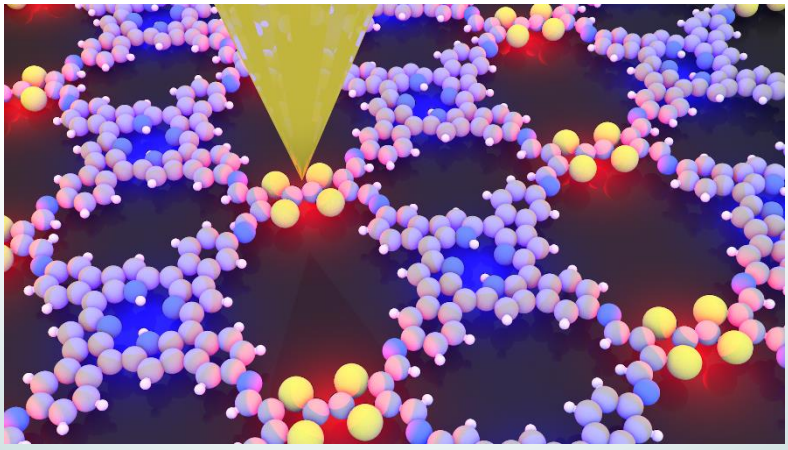
Imaging the effect of electron transfer at the atomic scale: from single molecules to photoactive frameworks

Electron transfer plays a crucial role in many chemical processes, from photosynthesis to combustion and corrosion. However, the effect of electron transfer on the electronic structure of organic molecules remains largely unclear. Unveiling these fundamental aspects requires the development of experimental tools allowing the observation of electron transfer down to the single molecule level. In this talk, I will present an imaging approach, namely single-electron alternate charging scanning tunneling microscopy (AC-STM), allowing mapping the orbital structure of single molecules upon electron transfer [1–3]. In this way, we unveiled the effects of electron transfer and polaron formation on the single-orbital scale. In the second part of the talk, I will focus on a recent set of experiments, where the orbitals of an organometallic dye molecule could be resolved upon photoexcitation. These results, obtained by combining a pulsed laser and high-resolution atomic force microscopy (AFM), open for the study of excitonic states in two-dimensional photoactive frameworks.



[1] L. L. Patera, F. Queck, P. Scheuerer, and J. Repp, Mapping Orbital Changes upon Electron Transfer with Tunnelling Microscopy on Insulators, Nature 566, 245 (2019).
[2] L. L. Patera, F. Queck, P. Scheuerer, N. Moll, and J. Repp, Accessing a Charged Intermediate State Involved in the Excitation of Single Molecules, Physical Review Letters 123, 16001 (2019).
[3] L. L. Patera, F. Queck, and J. Repp, Imaging Charge Localization in a Conjugated Oligophenylene, Physical Review Letters 125, 176803 (2020).

Tuesday, 11.10.2022, at 17:15 h, HS C (Technik)

Innsbruck Physics Colloquium,
Organisation: M. Beyer, K. Erath-Dulitz, H.-C. Nägerl, A. Reimer, T. Schrabback