IAP Seminar

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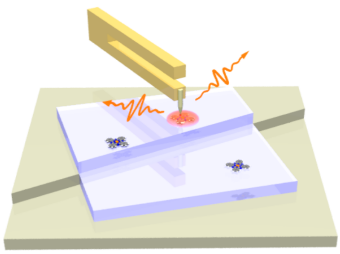
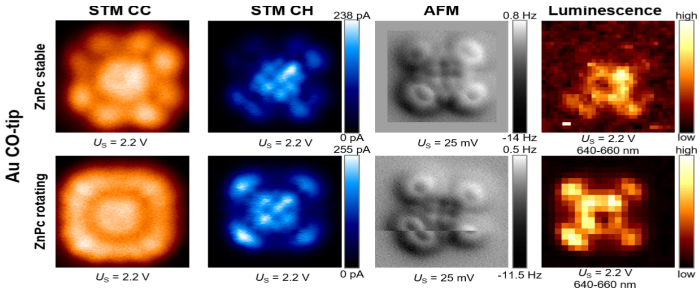
Tuesday, 17th December 2019, 16:00 s.t.
TU Wien, Institut für Angewandte Physik, E134
1040 Wien, Wiedner Hauptstraße 8-10
Yellow Tower „B“, 5th floor, SEM.R. DB gelb 05 B

Single-molecule electroluminiscence of phthalocyanine dyes

Recent development of tip-enhanced light spectroscopy reached resolution of single molecules and opened a new channel of information in addition to the versatile toolbox of methods available to scanning probe microscopy instrumentation working in ultrahigh vacuum and cryogenic conditions. [1] We use this opportunity to implement single-molecule electroluminescence methodology in a combined STM/AFM and apply it in a study of phthalocyanine derivatives and to address fundamental aspects of high-resolution photon imaging far beyond the Abbe's limit. The usability of functionalized tips for both AFM and electroluminescence imaging of single molecules is proven by a comparative approach; metal and CO-functionalized tips are used to obtain maps of atomic-force related signal and excitonic spectra over a ZnPc molecule, as a function of the polarity of the applied bias and workfunction of the substrates. This sheds some light on the exciton formation mechanism as well as on the ambiguity in interpretation of the photon maps. [2]
In our newest experimental efforts, we investigated photophysical phenomena occurring in the single CuPc and ZnPc emitters. A dual exciton emission of the ZnPc molecules plus their spatial correlation will be analyzed with respect to their electronic and geometrical properties and analogous behavior will be demonstrated for the CuPc moiety. Effects on the exciton energy and linewidth due to the local environment variations as Coulomb interaction with the dielectric substrate, decoupling from the metal electrode or the dipole-dipole interactions will be showcased and discussed.

[1] K. Kuhnke, C. Große, P. Merino, K. Kern, Chem. Rev. 2017, 117 (7), 5174– 5222
[2] J. Doležal, P. Merino, J. Redondo, L. Ondič, A. Cahlík, M. Švec, DOI:10.1021/acs.nanolett.9b03180





All interested colleagues are welcome to this seminar lecture (45 min. presentation followed by discussion).

Friedrich Aumayr
(LVA-Leiter)

Ulrike Diebold
(Seminar Chair)