Seminar announcement

Tuesday, July 23, 2024
1:30 pm
ZNN, Seminar room EG 0.001
Exclusively in person

"Ultrafast and ultrasmall: Probing atomic defects in 2D semiconductors with (lightwave-driven) STM"

Two-dimensional (2D) semiconductors provide an exciting platform to engineer atomic quantum systems in a robust, yet tunable solid-state system. In this colloquium, I will present our efforts to unravel the interesting physics behind single dopant atoms in transition metal dichalcogenide (TMD) monolayers such as the Jahn-Teller driven symmetry breaking at Re dopants and S vacancies in MoS2 [1].
Moreover, we aim to resolve the ultrafast charge dynamics at the atomic scale. Recently, we determined layer-dependent charge transfer lifetime of Se vacancies in WSe2 on graphene substrates [2]. I will also present our advancements in developing an ultrafast lightwave-driven scanning tunneling microscope using single-cycle THz pulses [3]. Mapping of the THz rectified charge as a function of dc bias and THz field amplitude ("QEV map") facilitates a precise calibration of the near-field transient bias, enabling state-selective tunneling into specific defect states or TMD bands [4].

References:
[1] F. Xiang*, L. Huberich* et al., Nat. Commun. 15, 2738 (2024)
[2] L. Bobzien et al. (in preparation)
[3] J. Allerbeck et al. ACS Photonics 10, 3888 (2023)
[4] L. Bobzien et al. APL Mater. 12, 051110 (2024)

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