IAP Seminar

Tuesday, 30th Nov. 2021, 16:00 s.t.
TU Wien, Institut für Angewandte Physik, E134
Wiedner Hauptstraße 8-10, 1040 Wien
Yellow Tower „B“, 5th floor, SEM.R. DB gelb 05 B

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Charge exchange dynamics of ions inside solids

Atomically thin materials probed by highly charged ions are an ideal model system to unravel charge exchange processes inside materials: Monolayer materials like single-layer graphene or MoS_2 naturally limit the interaction time of medium-energy ions with the material to a few fs only. Nevertheless, we find in our experiments that this short period allows for (almost) complete neutralisation. Consequently, the ion's potential energy – several tens of keV arising from the sum of binding energies of all missing electrons – can be deposited within one material layer alone. Here, I will discuss the mechanism which drives the energy transfer between ion and monolayer materials as well as their heterostructures.

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Nano-hillock formation on the CaF_2(111) surface due to individual slow Au-cluster impacts

Nanostructuring of surfaces and subsequent tuning of their properties is an important toolkit in nanoscience and surface physics. The formation of nano-hillocks induced by highly charged ions (HCIs) was found to be mediated by a strong coupling of electronic excitations to lattice heating. For the comparison of nanostructure formation between HCIs and heavy cluster ions, we utilize the CaF_2(111) surface as a model system. We present experimental evidence for a nanomelting process in the surface due to Au-cluster ion impact in the keV regime. With the high momentum transfer of the clusters we circumvent the process of electron-phonon coupling present after HCI impact. The melting then leads to rapid expansion of a nanometric volume and subsequent quenching results in the formation of nano-hillocks. Not only is it possible to create nano-hillocks similar to those found after irradiation with HCIs, but more importantly the size can be finetuned by varying the cluster-size of the impinging particles.

All interested colleagues are welcome to this seminar lecture(s) (2 x 20 min. presentations followed by discussion)

Friedrich Aumayr
(LVA Leiter)

Richard A. Wilhelm
(Seminar Chair)