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Fakultät für Physik

Isotopenphysik

I N V I T A T I O N

for a

V E R A - S E M I N A R

with

Richard Wilhelm

TU Wien, Institute of Applied Physics

Using slow ions in high charge states to modify and analyse free-standing two-dimensional materials

The interaction of slow highly charged ions with surfaces and 2D materials is governed mostly by charge exchange. Electron capture from the surface to the ion and subsequent de-excitation processes facilitate the release of potential energy stored in the ionic system. The amount of energy transferred to the electronic system of the solid is typically much higher than the kinetic energy loss close to the surface. Strong electronic excitations in the surface can cause material modification on the nanoscale, like perforation or nano-melting. Combining ion transmission spectroscopy, secondary particle emission spectroscopy, and sample microscopy after irradiation, we could show that the potential energy deposition is essentially confined to the topmost surface layer. Furthermore, the potential energy release of the ion depends strongly on the interatomic separation of the ion and the surface atoms upon transmission. We identified a specific distance-dependent two-centre Auger-Meitner process, the Interatomic Coulombic Decay (ICD), to drive the potential energy deposition. Our data suggests that charge exchange spectroscopy of slow highly charged ions can be used to determine the atomic structure or porosity of thin material layers, in particular for cases of radiation-sensitive materials where transmission electron microscopy may not yield sufficient contrast and resolution.

Thursday, 30.01.2025, 16:30 o'clock

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