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**Tuesday, 17<sup>th</sup> October 2017, 16:00 s.t.**

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1040 Wien, Wiedner Hauptstraße 8-10  
Yellow Tower „B“, 5<sup>th</sup> floor, SEM.R. DB gelb 05 B



## Highly Charged Ion Interaction with Surfaces and 2D-Materials

The impact of highly charged ions onto a solid surface gives rise to processes like charge exchange, ion stopping, formation of electronic excitations at the surface, scattering and sputtering. Subsequently the large amount of deposited energy (up to some 10keV) can lead to the formation of individual nanostructures at the surface ranging from pits to craters and even to hillocks depending on the material's response to the ion impact [1]. To study the energy deposition and its time dependence experimentally we recently used freestanding two-dimensional materials (e.g. graphene) as a target. By adjusting the ion's kinetic energy its interaction time with the 2D-solid can be controlled. Spectroscopic measurement of the ion after transmission allows the observation of a rapid charge capture and deexcitation process [2]. At the same time the ion experiences a large charge state dependent stopping force. In a joint theoretical and experimental effort ab-initio atomic and molecular structure calculations as well as time-dependent density functional theory simulations give insight into the charge exchange and deexcitation sequence upon impact of a highly charged ion on a solid surface [2,3]. Our study shows that highly charged ions are well suited to investigate material properties under extreme conditions on a femtosecond time scale.

[1] R. A. Wilhelm, A. S. El-Said *et al.*, *Prog. Surf. Sci.* **90**, 377 (2015).

[2] E. Gruber, R. A. Wilhelm *et al.*, *Nat. Commun.* **7**, 13948 (2016).

[3] R. A. Wilhelm, E. Gruber, J. Schwestka *et al.*, *Phys. Rev. Lett.* **119**, 103401 (2017).

**Richard A. Wilhelm** obtained his PhD in 2014 from TU Dresden in the field of materials modification with ion beams. From 2014 – 2017 he worked as a Research Associate at the Helmholtz Center Dresden-Rossendorf (HZDR), extending his research to new techniques combining 2D materials manufacturing, characterization as well as low energy electron microscopy. From April to Nov. 2016 he joined the group of Fritz Aumayr at IAP - TU Wien as a Postdoctoral Researcher and built up a new Electron Beam Ion Source facility there. The institute is happy to welcome him again in his new position as University Assistant starting October 1<sup>st</sup> 2017. Richard is a recipient of the HZDR research award and principal investigator of a DFG research project.

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

Friedrich Aumayr  
(LVA Leiter und Seminar Chair)