IAP Seminar

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Tuesday, 28th November 2023, 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

Ion implanted quantum structures in solid state matrices

Impurity atoms in solid state materials offer a flourishing platform with properties well suited for various applications from catalysis to quantum information technology. In this talk I will introduce our recent work on designing new atomic scale structures within solid state frames by ion implantation and subsequent characterisation by high-resolution scanning transmission electron microscopy and spectroscopy. Firstly, I will discuss two dimensional materials as a functional frame for impurity atoms, focusing on structures both within the 2D layer and between the interface of two sheets, covering their stability and challenges working with such systems. The structures are created by ultra-low energy ion implantation at the eV energy range, which serves as a versatile method to achieve various nanoscale structures. Secondly, I will introduce optically active impurity centers created in diamond matrices by ion implantation with keV energy range. Traditionally such quantum centers have been studied by spectroscopy methods while ab initio calculations have been instrumental in determining the exact atomic configurations. Employing high resolution electron microscopy, I will discuss our recent results on identifying individual quantum centers within diamond and present the first atomic scale images of such impurity configurations.

Harriet Åhlgren studied Physics at the University of Helsinki and defended her PhD thesis in 2015. Her thesis included the computational work proposing direct ultra-low energy ion implantation into graphene (Phys. Rev. B 2011).
After this she accepted a Postdoc position at the University of Nottingham in the UK, where she worked in the group of Elena Besley modeling nanomaterials. During this time she collaborated with the University of Helsinki Accelerator Laboratory developing the 500 kV ion implanter to reach ultra-low energies for implantation into nanomaterials. In 2019 she was awarded the Lise Meitner Fellowship by the FWF and moved to Vienna working on "Nanometer-scale chemical modification of 2D materials" in the group of Jani Kotakoski employing high resolution electron microscopy and multiscale modeling methods. Currently she is an Academy Research Fellow at the University of Helsinki where she investigates new functional quantum structures in solid state materials.

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

Friedrich Aumayr
(LVA-Leiter)

R. Wilhelm
(Seminar Chair)