CENIDE & WIN Seminar Series on 2D-MATURE

DFG IRTG 2803 & NSERC CREATE

Jani Kotakoski

University of Vienna

“Atomically precise structures tailored into 2D materials”

February 5th, 2026
10:00 a.m. ET / 16:00 p.m. CET

Jani Kotakoski is one of the pioneers in the field of atomic-scale structural manipulation of low-dimensionalmaterials. His research combines electron and ion irradiation, in the context of experimental materials physics,atomic-resolution transmission electron microscopy, and computational physics. Since obtaining his PhD at theUniversity of Helsinki in Finland in 2007, he worked as a postdoctoral researcher in Germany and Finland, beforejoining the University of Vienna in Austria in 2011, where he is a full professor since 2022. His current mainresearch aim is creating atomically tailored structures embedded in solid-state matrices to pave the way for thesecond quantum revolution, and green energy production and storage.

Transmission electron microscopy (TEM) is often carried out separate from other experimental steps, allowing only “post mortem” analysis. This is a significant disadvantage compared to for example scanning tunneling microscopy, where the microscopic investigation is directly integrated as a part of the same experimental setup where the samples are grown and manipulated. There is however no fundamental reason why TEM and scanning TEM (STEM) could not be similarly integrated into more comprehensive system. In this overview presentation, I will present the experimental setup that we have established at the University of Vienna over the past decade to overcome this disadvantage [1]. I will further show how this setup and other advances made in the group in manipulation of 2D materials have enabled research towards truly atomically precise structures that can be tailored into 2D materials (e.g., Refs. [2-8]) for applications ranging from catalysis to quantum information technology.

1. Mangler et al., Microsc. Microanal. 28 S1, 2940 (2022)
2. Trentino et al., Nano Lett. 21, 5179-5185 (2021)
3. Leuthner et al., 2D Mater. 8, 035023 (2021)
4. Trentino et al., Micron 184, 103667 (2024)
5. Längle et al., Nat. Mater. 23, 762 (2024)
6. Speckmann et al., Adv. Mater. Interfaces 12, 2400784 (2024)
7. Längle et al., arXiv: 2404.07166 (2025)
8. Joudi et al., Phys. Rev. Lett. 134, 166102 (2025)