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S E M I N A R
on
Semiconductor Physics and Nanotechnology

Mo, 08.04.2024, 11:15 Uhr,

Seminar in person in the Physics lecture hall *or* via Zoom

"2D materials for the next-generation electronics studied at the atomic scale with ncAFM"

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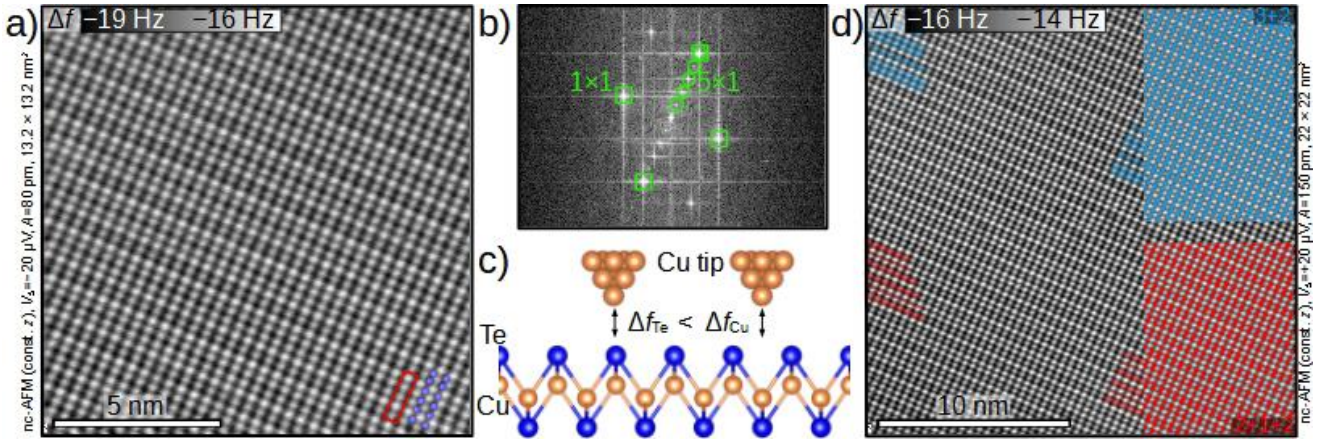
The need for the next-generation electronics stems from the fundamental physical limitations of the Si-based technology: the transistor, the basic building block of electronics, cannot be miniaturized much further since, among other things, the native SiO_2 gate dielectric becomes too thin and permits quantum tunneling from the gate to the active semiconducting channel. To overcome limitations of the classical MOSFETs, a new type of FETs is necessary, ideally composed of two-dimensional (2D) materials.

A rough classification of 2D materials, in the context of their potential applications, can be made into metals, semiconductors, and insulators. In this talk, I will present our recent results with atomically resolved insights into each class of these materials. Namely, I will present the investigations of metallic CuTe, semimetallic $PtSe_2$, semiconducting HfS_3, and insulating LaOBr surfaces.

Our approach lies in cleaving 2D materials in ultra-high vacuum (UHV) and studying them with noncontact atomic force microscopy (ncAFM), to reveal their true atomic configurations and the presence of atomic-scale defects. Characterization of the candidate materials for the next-generation FETs at the atomic level is desirable for rationalizing the behavior of constructed prototype devices, and necessary for understanding their potential at scales smaller than the current technology.

The talk will focus on the basics of the ncAFM technique in the introduction, and progress to the application on selected systems afterwards. Figure below illustrates our approach: we resolve two separate domains within the 5×1 reconstruction on CuTe induced by a high temperature charge density wave.



Zoom – Link:

https://zoom.us/j/96375934537?pwd=RTlKTWhSdzRHU211YTY1bGFxTUtpZz09

Meeting-ID: 963 7593 4537

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