Graduate Program in Spintronics
Seminar

"TRANSITION METAL DICHALCOGENIDES STUDIED BY CRYOGENIC SCANNING TUNNELING MICROSCOPY"

Dr. Stefan FÖLSCH

PAUL-DRUDE-INSTITUT FÜR
FESTKÖRPERELEKTRONIK

Time : 3:00pm-5:00pm

Date : Monday, October 29, 2018

Venue: Lecture Room 745

**Science Complex B, Aobayama Campus,
School of Science, Tohoku University**

[Aobayama Campus]

7F
Lecture room
745
Science
Complex B
Bldg.

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Transition metal dichalcogenides studied by cryogenic scanning tunneling microscopy

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Two-dimensional (2D) transition metal dichalcogenides are of great interest because they represent atomically thin semiconductors. We use scanning tunneling microscopy (STM) at 5 K to study WSe_2 layers grown on epitaxial graphene which is formed on SiC(0001). Specifically, we use partially hydrogenated substrates with areas of quasi-freestanding bilayer (QF2L) graphene coexisting with bare monolayer (1L) graphene. It is found that an abrupt and structurally perfect homojunction is formed when WSe_2 overgrows a lateral QF2L-1L junction in the graphene. The band structure modulation within the WSe_2 layer arises from the varying work function of the graphene beneath. This effect can be utilized to create quantum dots that confine either valence or conduction band states. If time permits, I will also discuss vertical heterojunctions consisting of MoS_2 on WSe_2, deposited on epitaxial graphene. A mismatch-induced moire pattern is observed in this case. Tunneling spectra show sharp conductance peaks near the band edges, revealing the emergence of discrete states confined within the moiré unit cell. Our results show that cryogenic STM is a powerful tool to explore interfacial as well as quantum effects in 2D layered materials.