University of Zurich[UZH]

Low Dimensional Systems Group

From fundamental processes to next generation electronics

Group video

Group homepage

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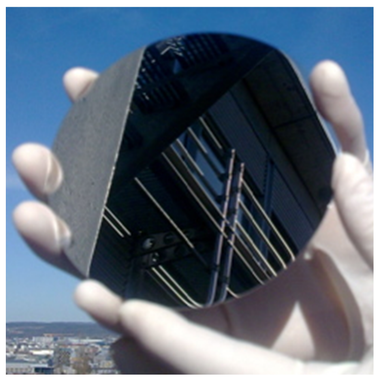
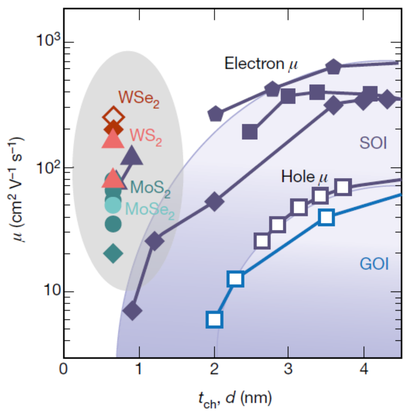
Physik-Institut Open Day, 2022.11.17-18

Designing, manipulating and measuring nano stuff? Sounds cool, doesn't it? We investigate fundamental processes on surfaces and apply our knowledge to build, measure and improve our own nanoscale-functional units, like single atomic layers and not so-small molecules.

Systems

Electronics beyond Si: 2D Boron Nitride





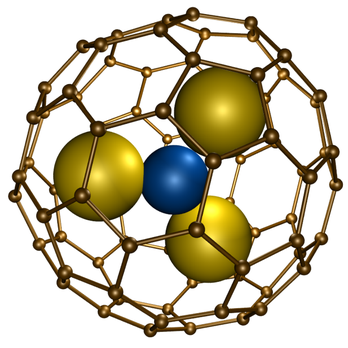
The semiconductor problem: Nanometer-thin silicon is insulating, while two-dimensional (2D) materials keep their conductivities. [1]

We fabricate scalable state-of-the-art BN materials with Chemical Vapor Deposition (CVD).

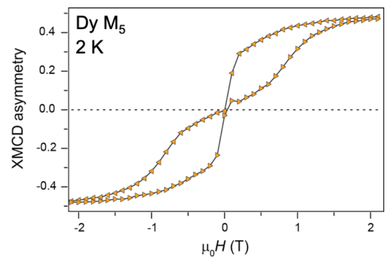
BN
www.swissBN.ch

[1] D. Akinwande *et al.* Nature 573, 507-518 (2019)

Endofullerenes: 0D Magnets



$DySc_2N@C_{80}$



JACS 134 (2012) 9840

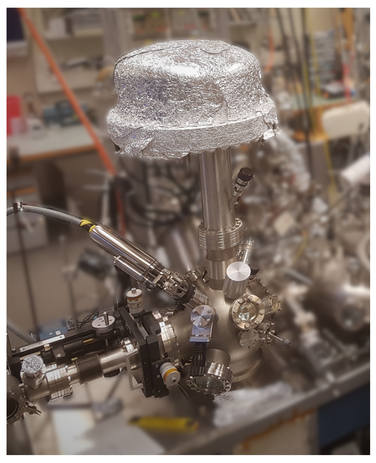
Single molecule magnets: Nanometer spin systems that may be applied in Quantum objects like Qbits[2].

We try to control the endohedral units with electrical fields.

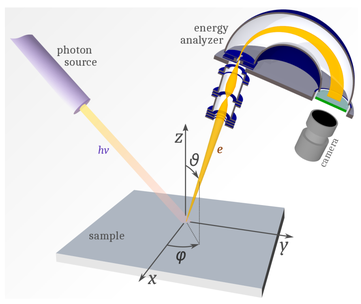
[2] M. Leuenberger, and D. Loss, Nature 410, 789–793 (2001)

Methods

Photoelectron spectroscopy: Measuring characteristics of surfaces at the atomic level

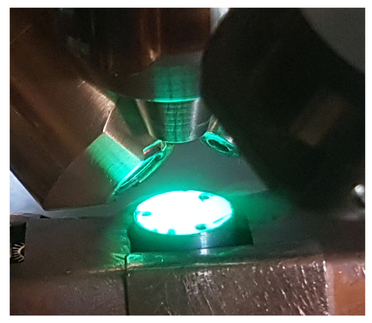


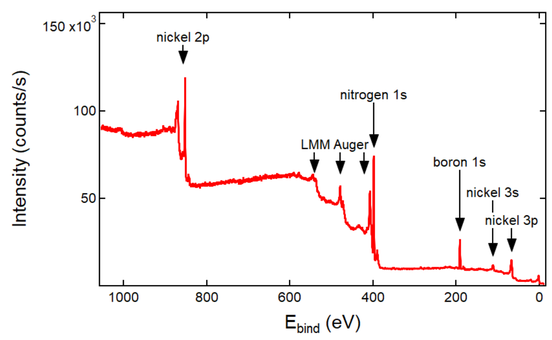
Photoelectron spectrometer as **the tool** for sample analysis



The principle of photoelectron spectroscopy (https://de.wikipedia.org/wiki/ARPES)

The photoelectron-spectroscopy lecture @UZH



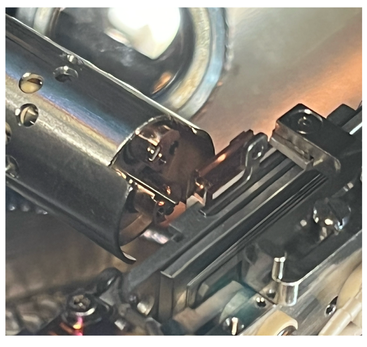


Sample excitation with soft x-rays:

The kinetic energy of the emitted electrons allows to determine the elemental composition of the surface.

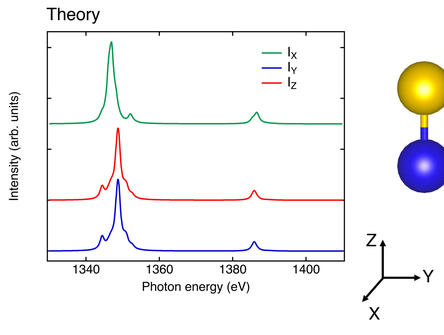
$$E = \hbar\omega$$

X-ray absorption spectroscopy: Accessing molecular orientation

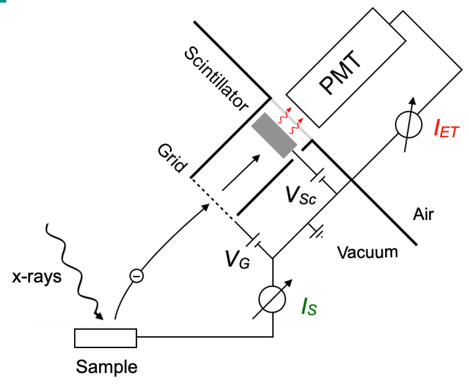


LoTNE with sample during evaporation

- Single molecule magnets are evaporated on substrates with the Low Temperature Nanogram Evaporator (LoTNE).
- Molecules: $Ho_3N@C_{80}$, $Tb_3N@C_{80}$, $Dy_2ScN@C_{80}$, etc.
- X-ray Absorption (XAS) spectra were measured at the PEARL beamline at the Swiss Light Source (SLS).



- X-ray linear dichroism for the determination of the molecular orientation.



SLS@PSI Villigen AG

Secondary electron detection schematics [3] at the Swiss Light Source.

[3] W.C. Lee *et al.* JVST:A 40 053205 (2022)

Thesis Projects: Contact the group

GRAPHENE FLAGSHIP

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