

Bachelor and Master theses projects in Surface Physics and Low Dimensional Systems 2022



<https://www.physik.uzh.ch/groups/osterwalder/>

Ambient pressure XPS at PSI

Bachelor thesis: Recrystallization of ultrapure metals

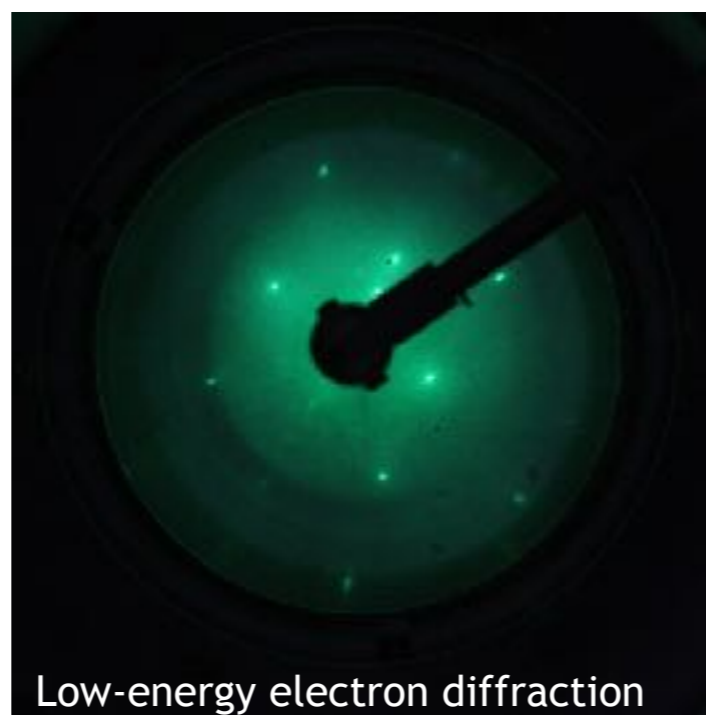
- Many materials are not available as single crystals at a reasonable price
- We are currently studying recrystallization of metals using ultrapure Cu foil placed on top of quartz plate
- We already studied recrystallization of Cu towards Cu(111) using LEED and AES up to 1000 °C (below the melting point)
- The goal is to go towards higher temperatures to further improve the crystallinity, and to grow hexagonal boron-nitride films on such liquid copper

- **Important:** the experimental part of the thesis (3-4 weeks) has to be performed at the Swiss Light Source at the Paul Scherrer Institute (in Villigen, AG)

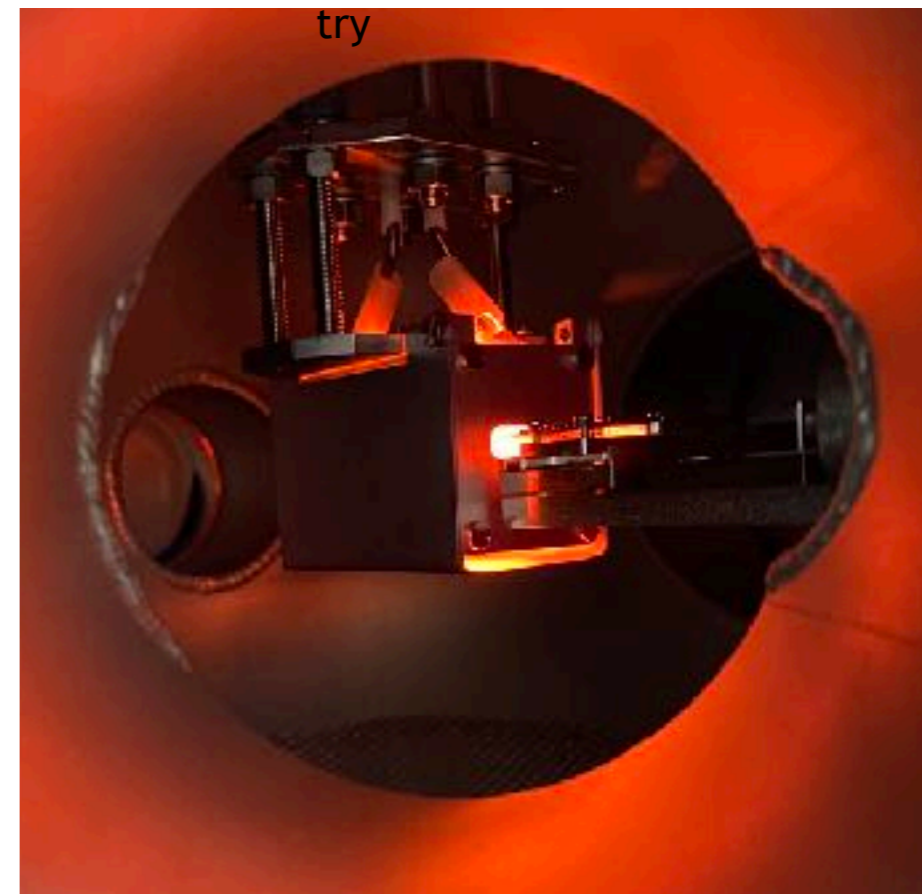


Sample

geome
try



Low-energy electron diffraction

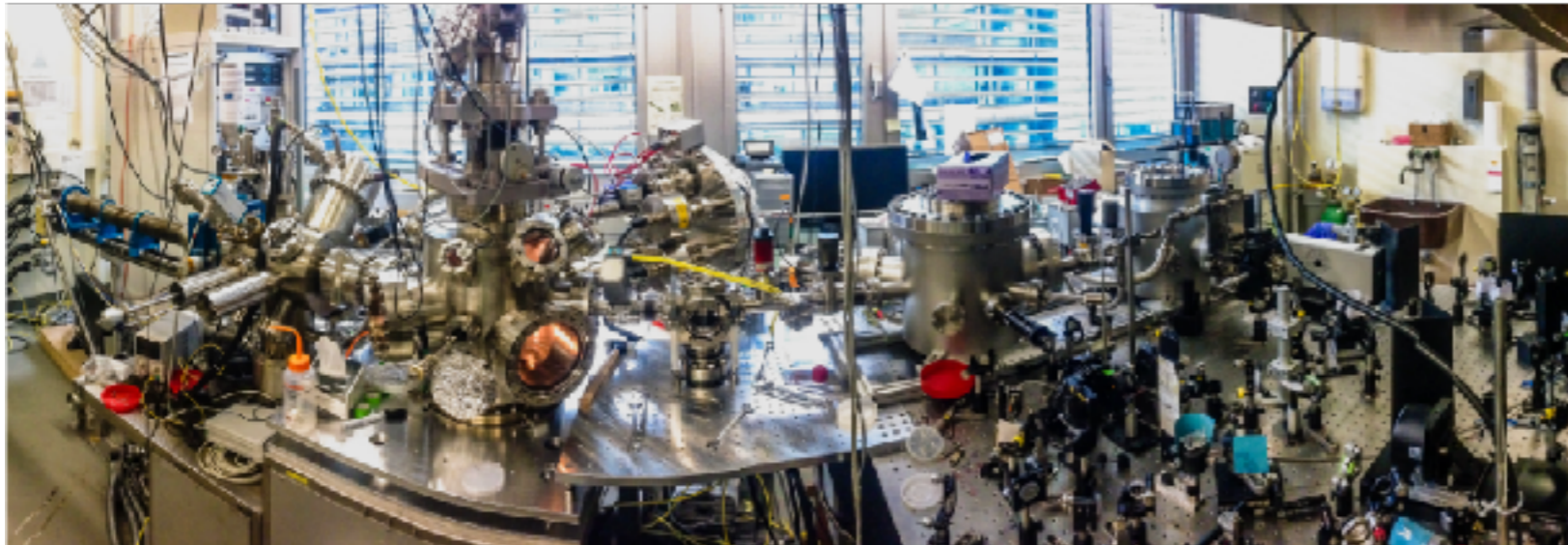


1000 °C @ 120 W, 3.7×10^{-7} mbar

Contact: Zbynek Novotny: zbynek.novotny@psi.ch

Time-resolved electron spectroscopy from surfaces

Goal: observe electron dynamics and charge transfer on real timescales

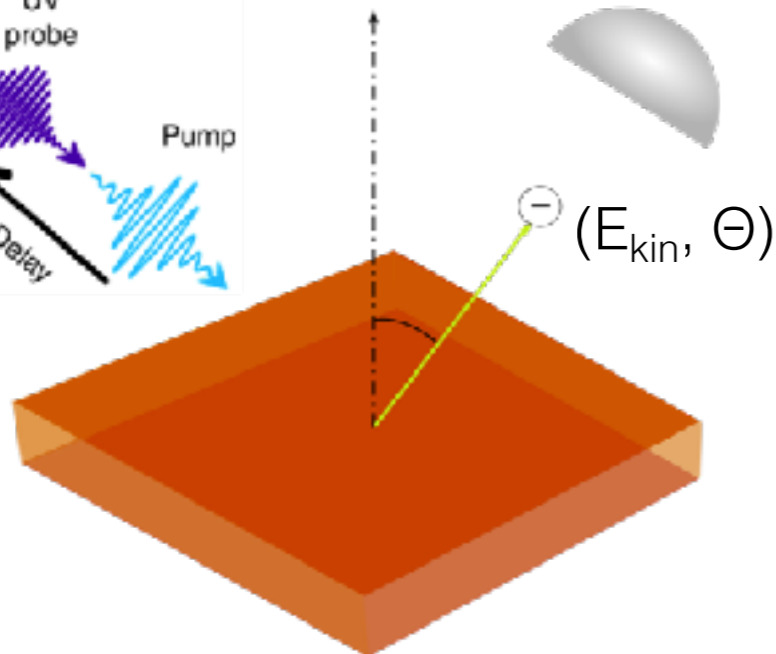
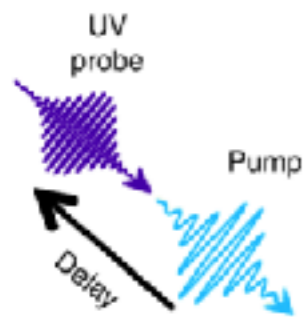


femtosecond pulsed laser

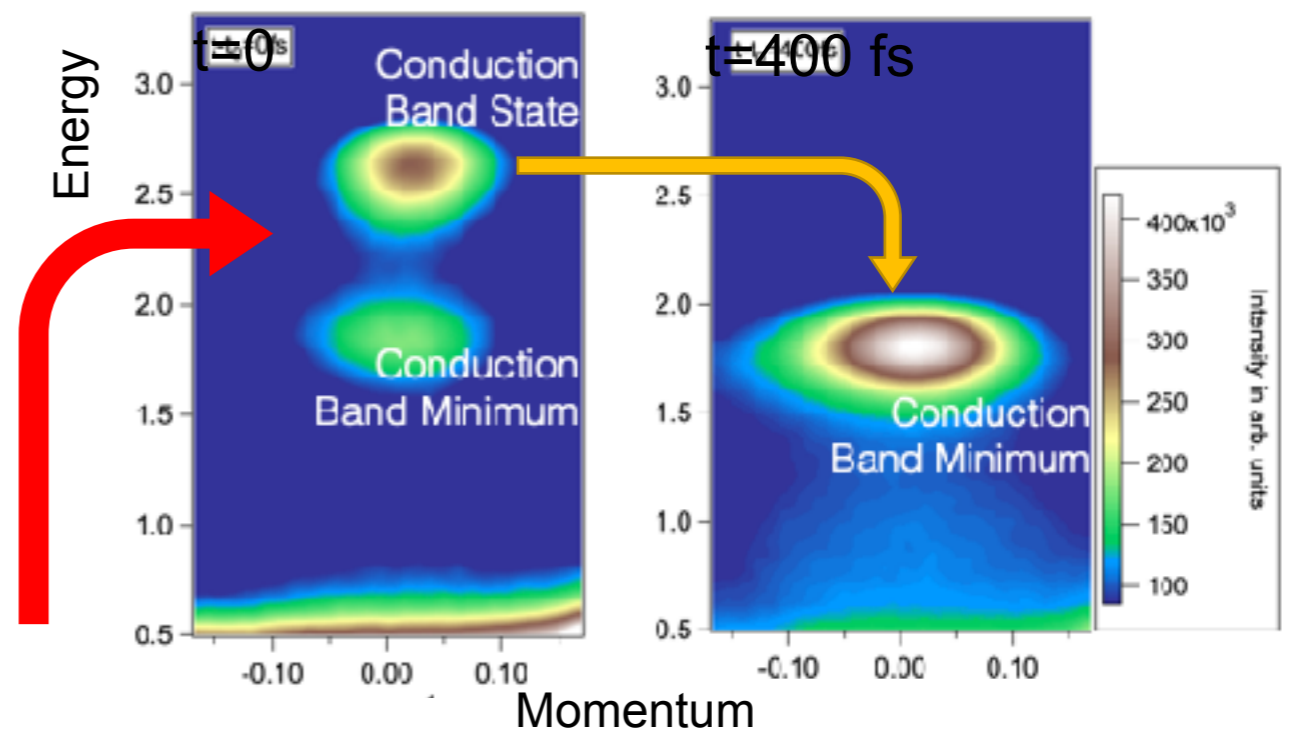
vacuum system with electron spectrometer TREx

Light excitation

Electron detector



Excitation and **decay** of electrons into unoccupied states



Data from: L. Grad, Z. Novotny, M.H., and J. Osterwalder, Sci. Rep. 10, 10866 (2020)

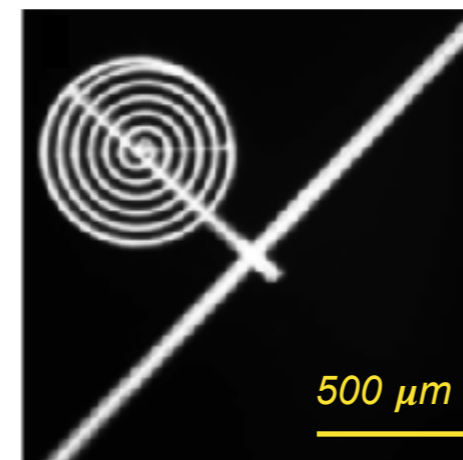
Contact: Dr. M. Hengsberger matthias.hengsberger@physik.uzh.ch

SINERGIA Lab: *2D materials for the future*



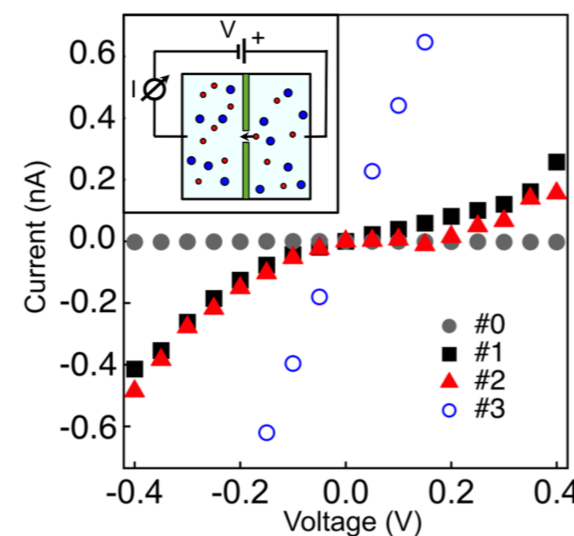
<https://tube.switch.ch/videos/594c3e29>

Bachelor thesis:
graphene/*h*-BN device fabrication with
a super ink jet printer.



Silver traces printed on SiO₂
Wei Chuang Lee UZH 2020

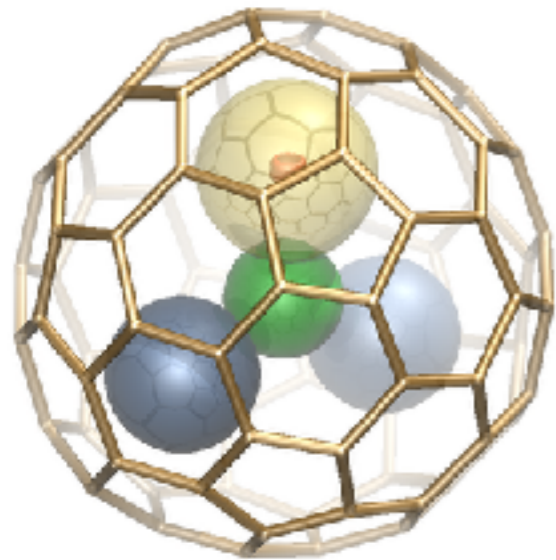
Master thesis:
Nanovoidal 2D membrane applications in gas
or in liquids.



Ion conductivities across 2 nm
pores in single layer *h*-BN
Cun *et al.* Nano Lett. 18, 1205 (2018)

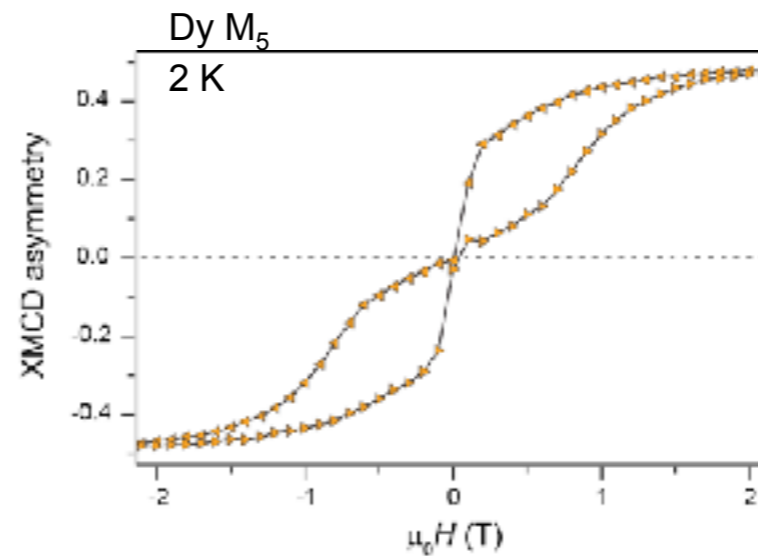
Contact: Thomas Greber 36K88, greber@physik.uzh.ch

SQUID Lab: Single Molecule Magnets



∅ 1.1 nm

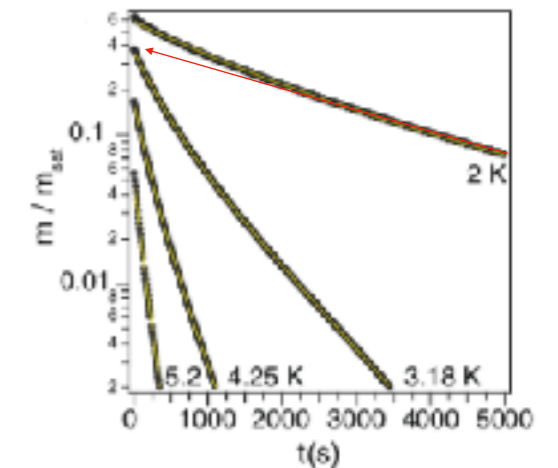
DySc₂N@C₈₀



JACS 134 (2012) 9840

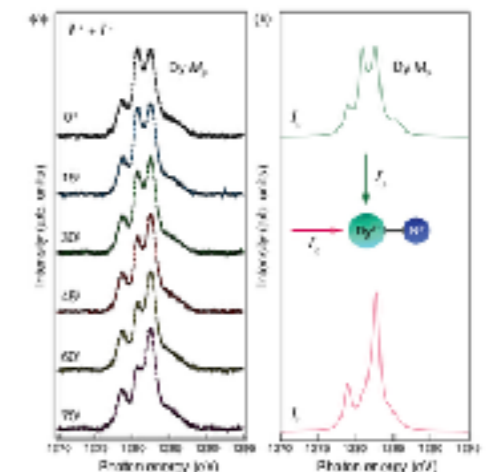
Bachelor thesis:

The riddle of the non-exponential decay of the magnetisation of Dy₂ScN@C₈₀ shall be analysed by cooling history dependent demagnetisation measurements in the SQUID magnetometer.
See: Westerström *et al.* Physical Review B, 89, 060406(R) (2014).



Master thesis:

The orientation of the quantisation axes in DySc₂N@C₈₀ shall be measured with x-ray absorption spectroscopy at the Swiss Light Source.
See: Westerström *et al.* Physical Review Letters, 114, 087201 (2015).



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XAS from Dy₂Sc@C80/Rh(111)