

UHV STM laboratory of the Institute of experimental Physics of the Slovak Academy of Sciences and the Institute of Physics, Faculty of Science, P. J. Safarik University in Kosice was established within the framework of the project PROMATECH (ITMS: 26220220186).

Location

The laboratory is situated in the building of the Institute of Physics, Park Angelinum 9, Košice.

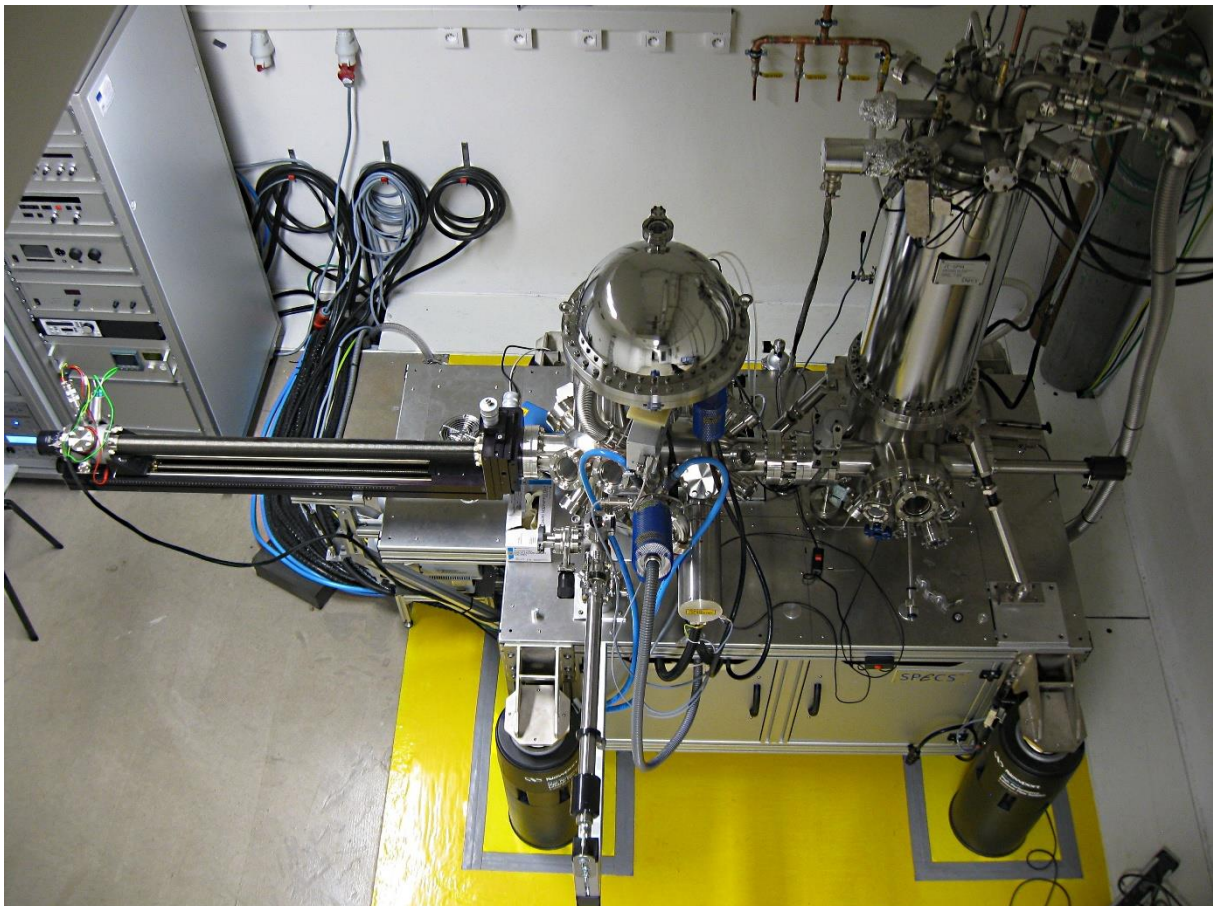
Experimental facilities

The laboratory is equipped with a complex setup for preparation and characterization of thin films and nanostructures in ultra-high vacuum with an integrated scanning probe microscope operating at ultra-high vacuum, ultra-low temperatures and high magnetic fields.

Personnel in charge:

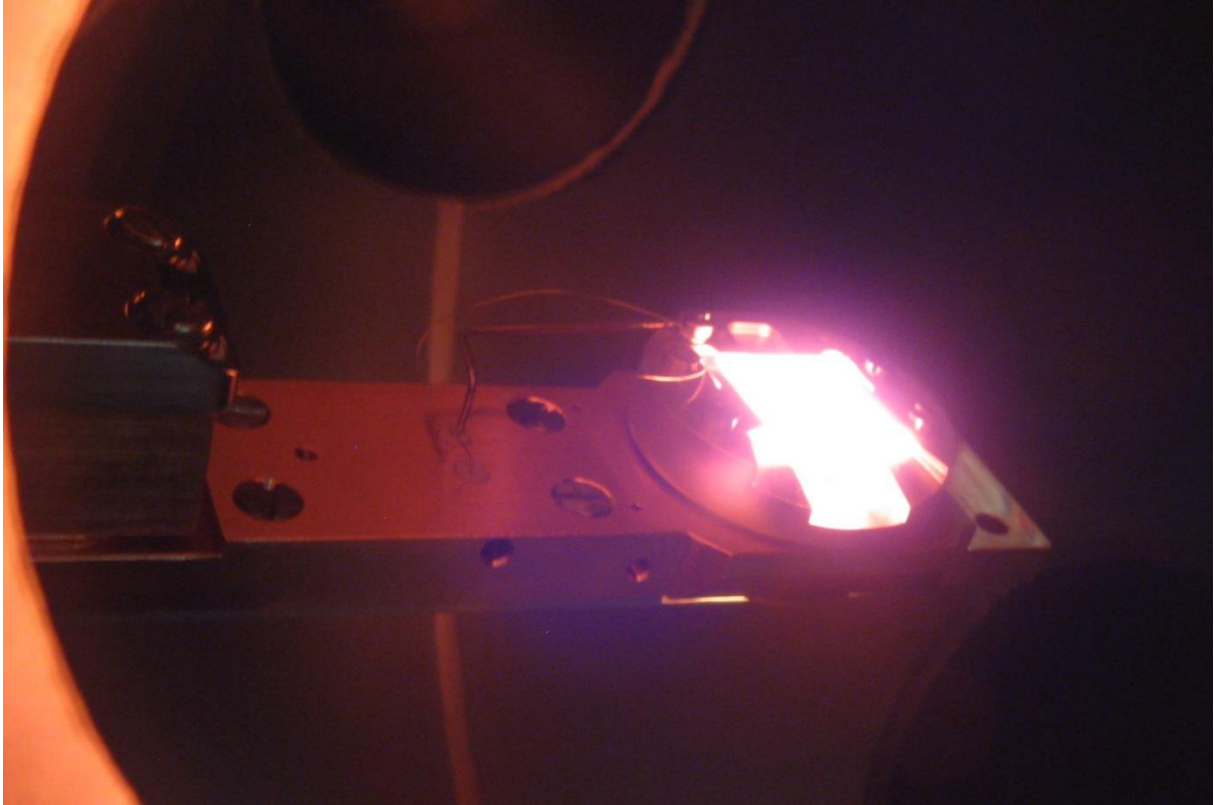
Mgr. Pavol Szabó, CSc., ÚEF SAV Košice

Mgr. Tomáš Samuely, PhD., ÚFV PF UPJŠ Košice



Experimental methods:

The experimental setup from Specs co. consists of two interconnected vacuum chambers operating at a pressure below 10^{-10} mbar. The preparation chamber is equipped with:



Custom Manipulator

- 4-axis high precision sample manipulator (DN100CF)
- Linear in x-, y- and z-direction, shifts are Dx, Dy: +/- 12.5 mm, Dz: 900 mm
- Polar rotation $\pm 180^\circ$
- Electron beam heating to 1000°C and N₂ cooling
- Separate position for direct current heating

Multi-Pocket E-beam Evaporator EBE-4-2L2F

- Four pocket e-beam evaporator on NW35CF (2.75") flange with two fixed length holders and two linear motion holders for simultaneous co-evaporation of up to four different materials from rods or crucibles.

High Temperature Effusion Cell HTC-40-2-2000-WK-SHM

- for the evaporation of materials with low vapor pressure

Quartz Crystal Microbalance

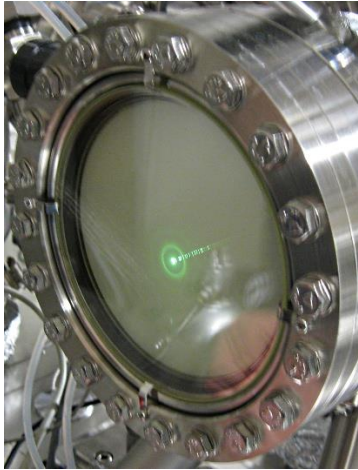
- for controlling the film thickness during evaporation

IQE 11/35 3kV

- A very stable extractor type ion source operating with a long-lifetime special Yttrium oxide coated Iridium filament. It is a robust, compact and easy-to-handle source for sputter cleaning of samples in UHV.

RHEED

- Reflected high-energy electron diffraction for the characterization of thin film growth



PHOIBOS 100 MCD Energy Analyzer Classic-Package for XPS, UPS, AES, SAM, ISS and LEIS

- multi-channel detector with "extended dynamic range" CEM

X-Ray source

- for X – ray Photoelectron Spectroscopy

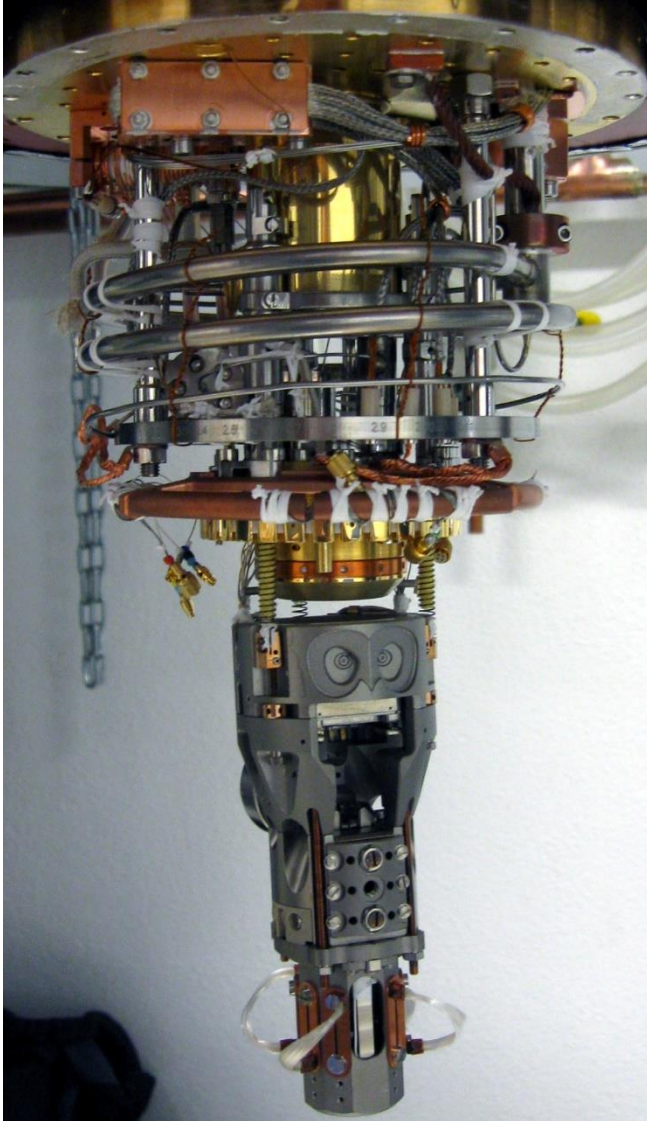
Quadrupole Mass Spectrometer

- for residual gas analysis during evaporation

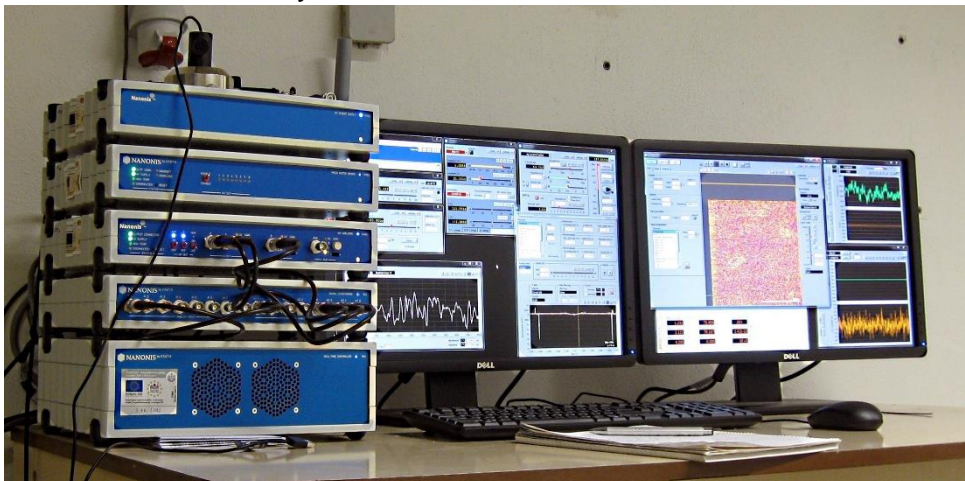
The STM chamber is equipped with:

Specs JT scanning probe microscope operating at ultra-high vacuum, ultra-low temperatures and high magnetic fields

- UHV STM system, temperature interval of 1K – 300 K with Joule-Thomson refrigerator and modular Tyto head allowing the use of various sensors like qPlus, Kolibri and STM, enabling simultaneous AFM/STM measurements in magnetic fields up to 2 T.

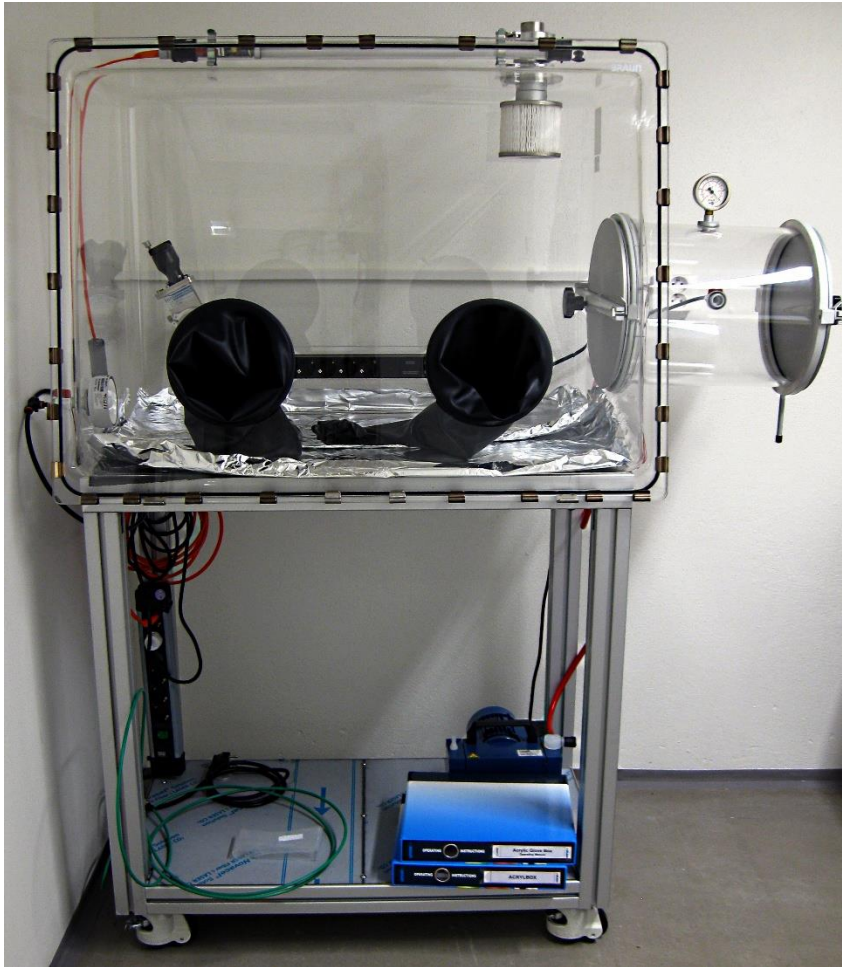


- Liquid Nitrogen and ^4He cryostats
- Superconducting magnet providing fields up to 3 T perpendicular to the scanning plane.
- Control electronics by Nanonis.



Separate glovebox with inert atmosphere

- With the possibility to connect to the vacuum chamber for direct sample transfer



Total cost: 932.140 €

Realization: project PROMATECH (ITMS: 26220220186)

Research areas:

- High resolution topography
- High resolution tunneling spectroscopy
- in-situ preparation and characterization of thin films and nanostructures
- manipulation of individual atoms and molecules