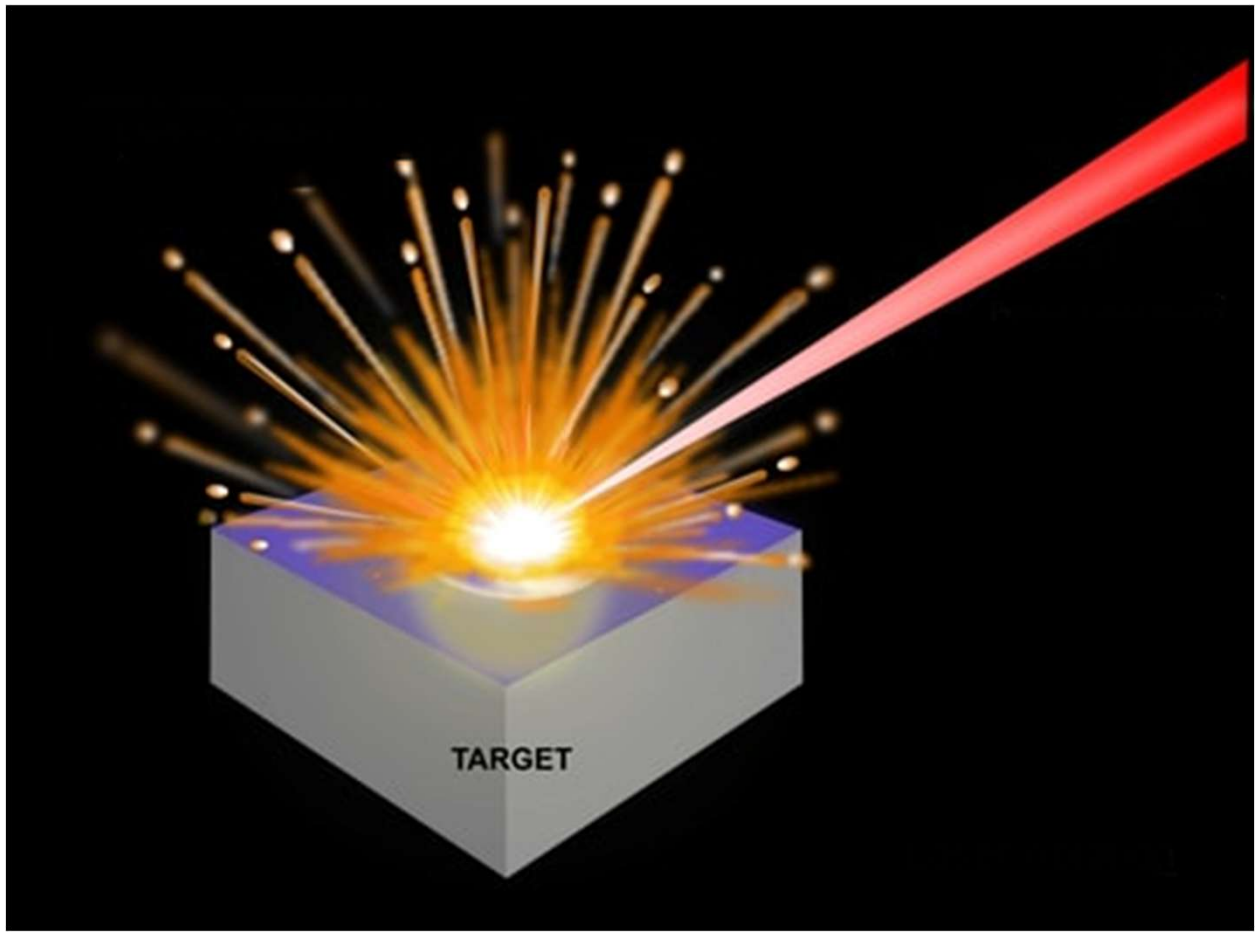
Department of Atomic Physics

FIII. épület, magasföldszint
(1111 Bp., Budafoki út 8.)
https://fat.physics.bme.hu/



Surface Physics Laboratory

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Fields of Interest

I. Surface analysis

- XPS (X-ray Photoelectron Spectroscopy)
- AES (Auger Electron Spectroscopy)

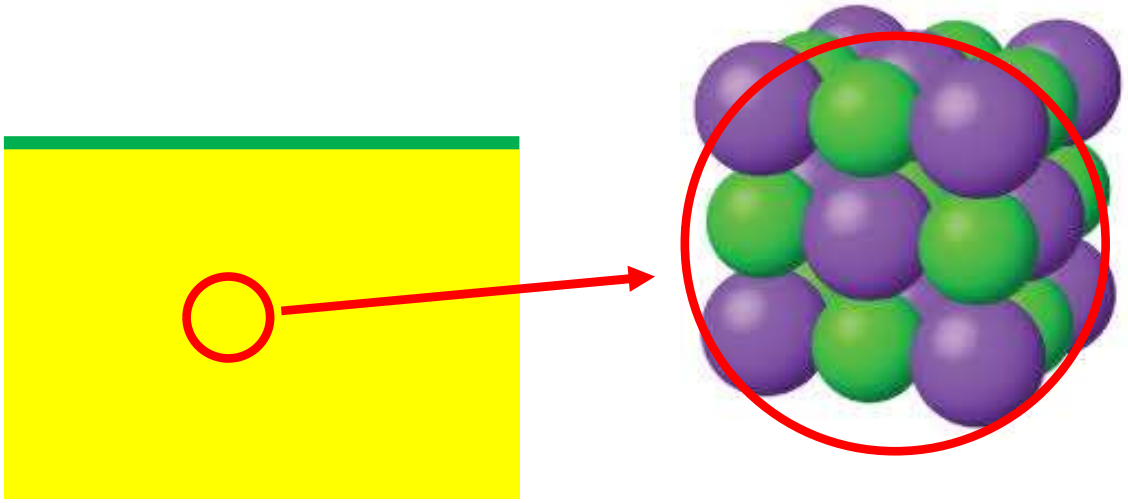
II. Mass spectroscopy, vacuum technology and their applications

Catalytic reactions, diffusion, permeation

III. Thin layer deposition

- CVD (Chemical Vapour Deposition):
  Creation of diamond nanostructures

Surface Analysis - Motivation



Bulk of the body

- Uniform in all directions
- Neighbourhood of an atom is of similar atoms

Surface

- Quick transition between the body and the outer world
- Neighbourhood of surface atoms is the body in one direction, the outer world in the other

Particularities

- Physical state
- Chemical properties
- Composition
- *Small amount of material*

Surface Analysis - Practice

Importance of Surface ➡ Applications

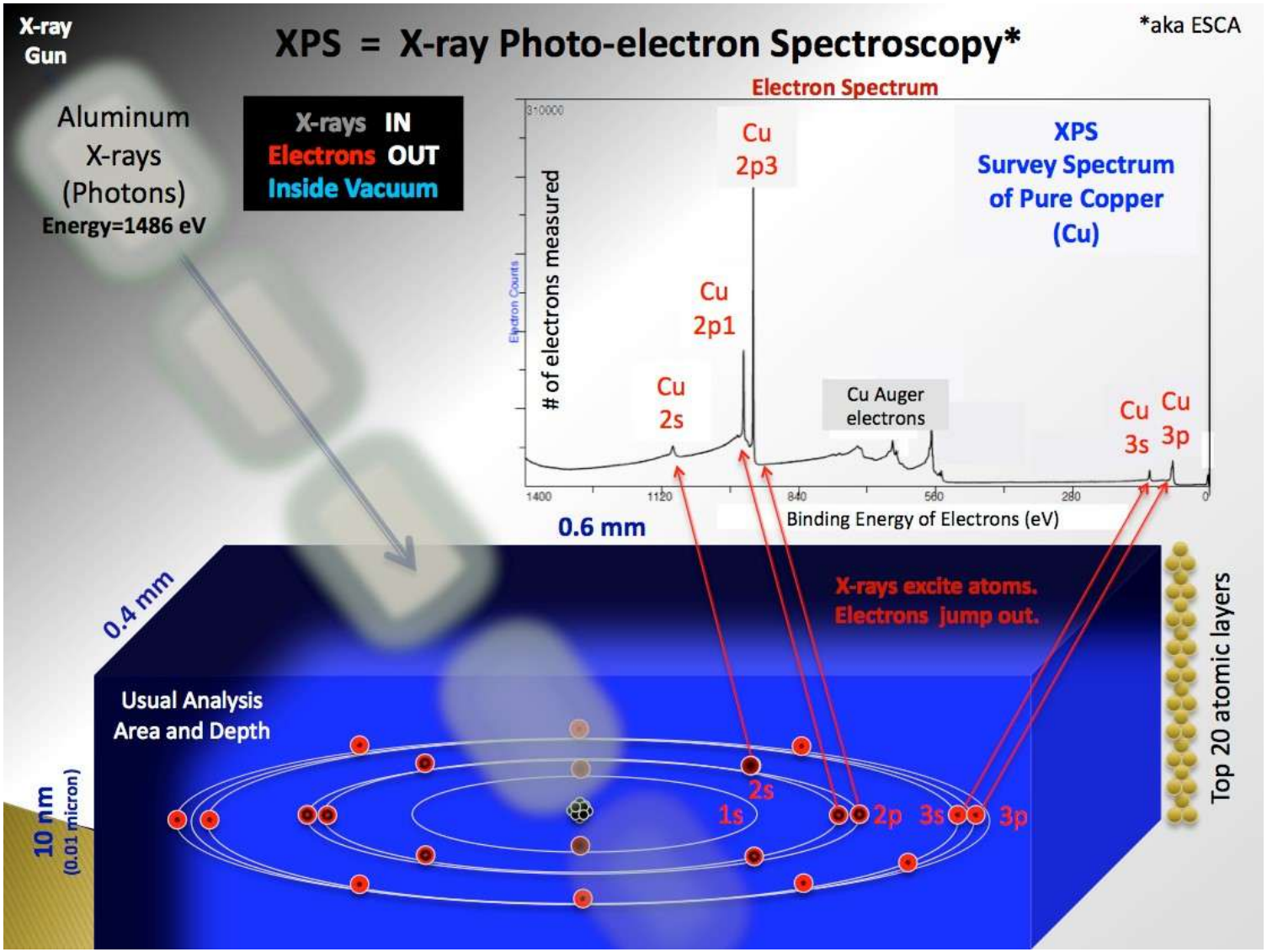
- Micro- and nanostructures
- Thin layers, boundary layers, optical applications
- Adsorption, desorption, corrosion, adhesion
- Diffusion, implantation, doping
- Semiconductor industry, pharmaceutical industry, energy sector, etc.

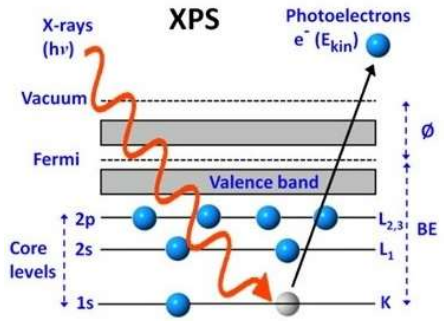
Thesis topics (B.Sc. & M.Sc.)

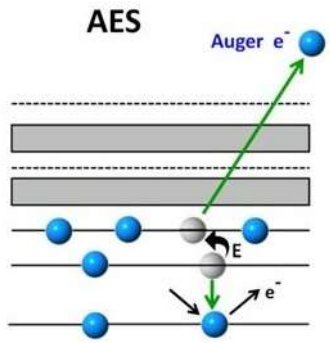
- **Investigation of surface compositions, contaminants and chemical states**
- **Elemental analysis**
- **Investigation of effects of sample thinning**

Surface Analysis – Apparatus I

XPS-AES background

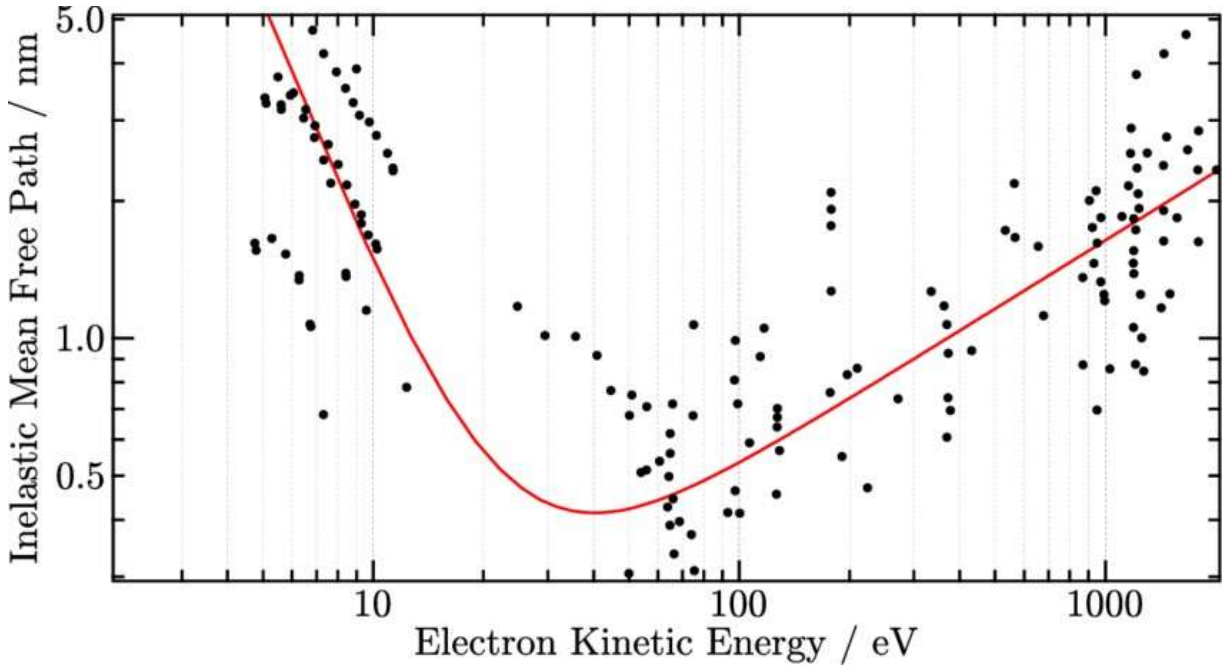


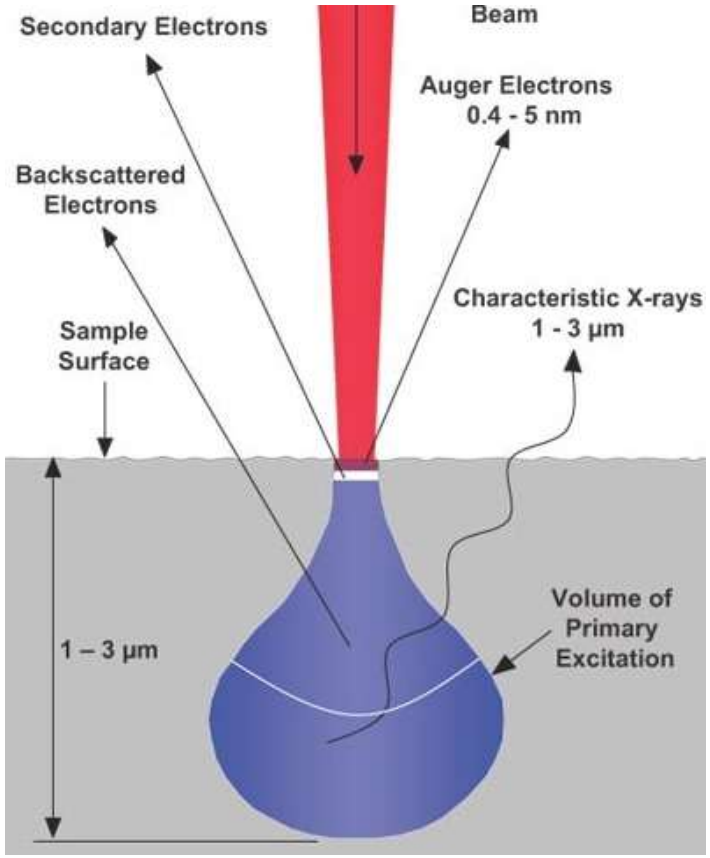




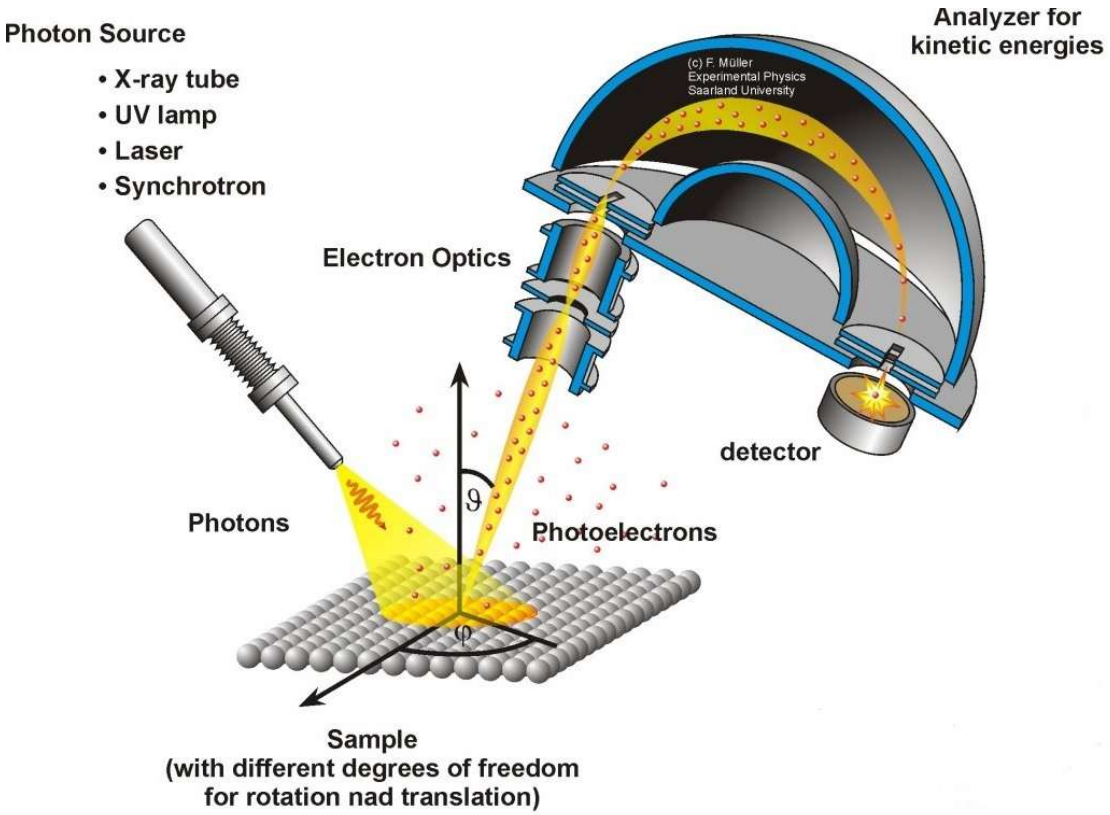
Surface Analysis – Apparatus II

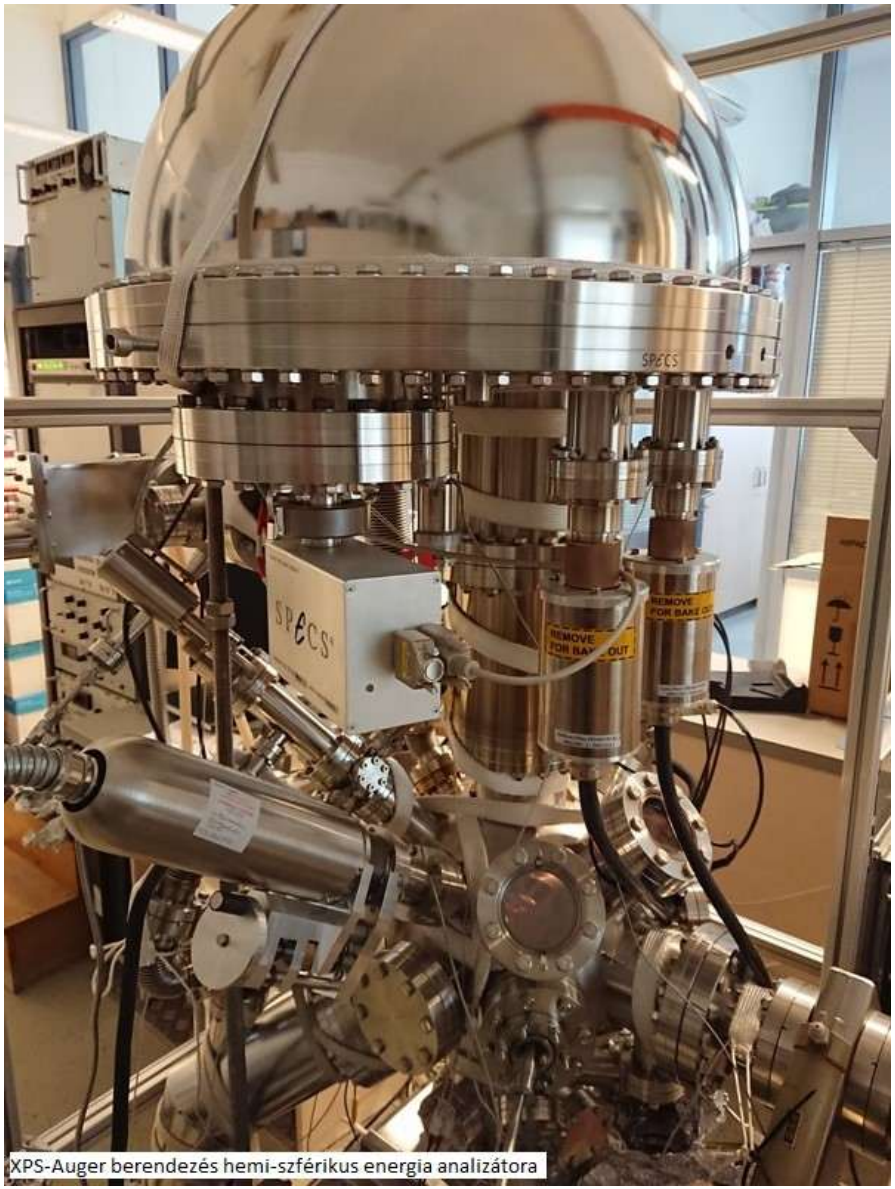
Surface sensitivity





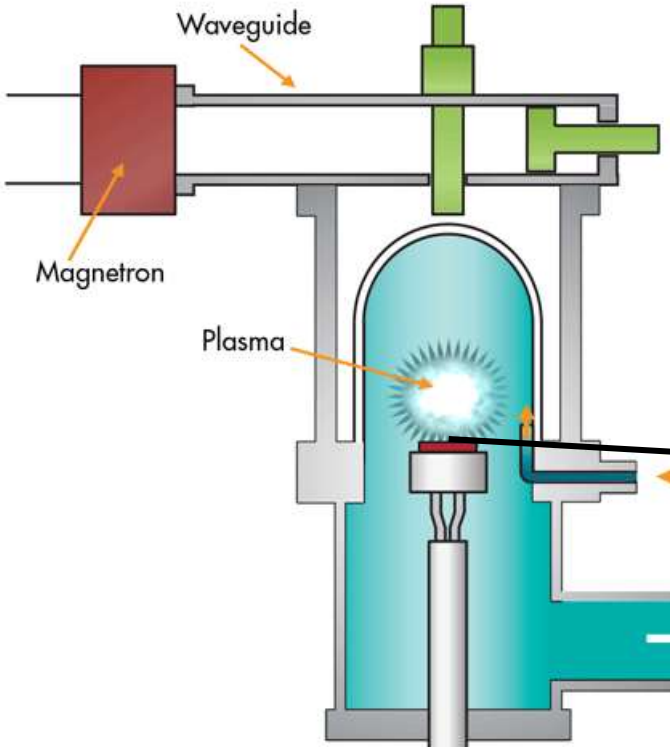
Surface Analysis – Apparatus III





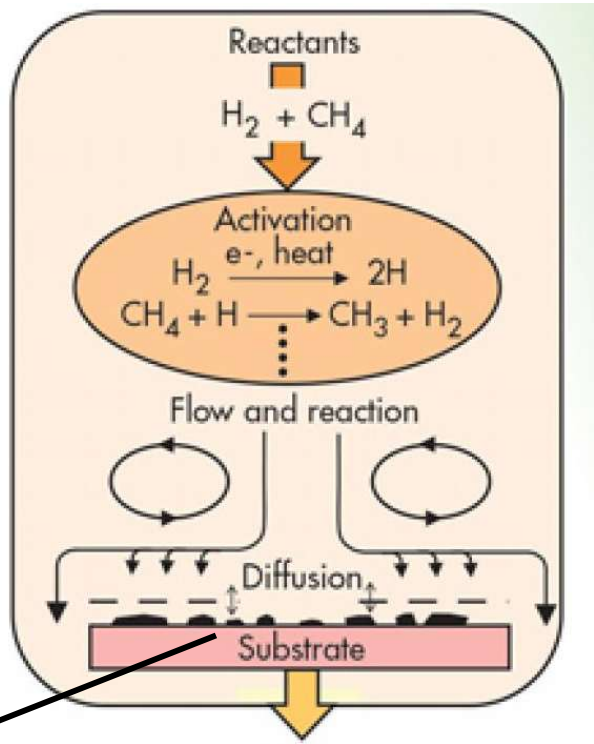
XPS-Auger berendezés hemi-szférikus energia analizátora

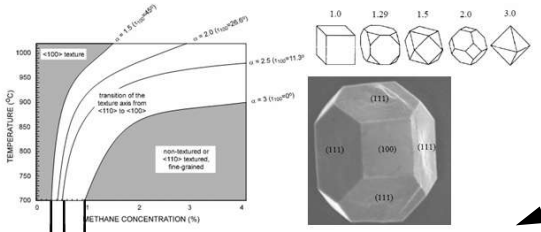
Synthesis of surface micro- and nanostructures

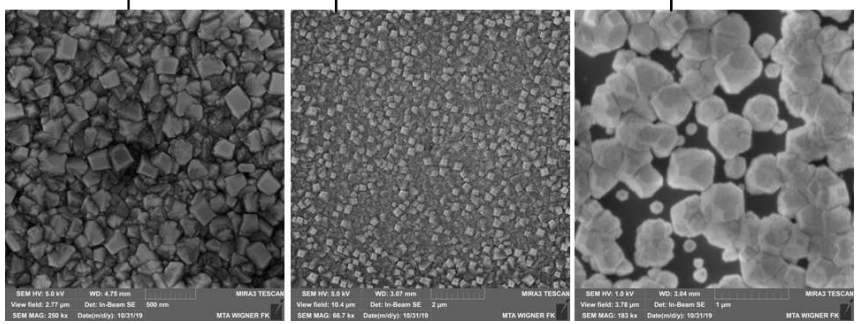


CVD: Chemical Vapour Deposition

Source gases + Activation ➡ **Layer deposition**







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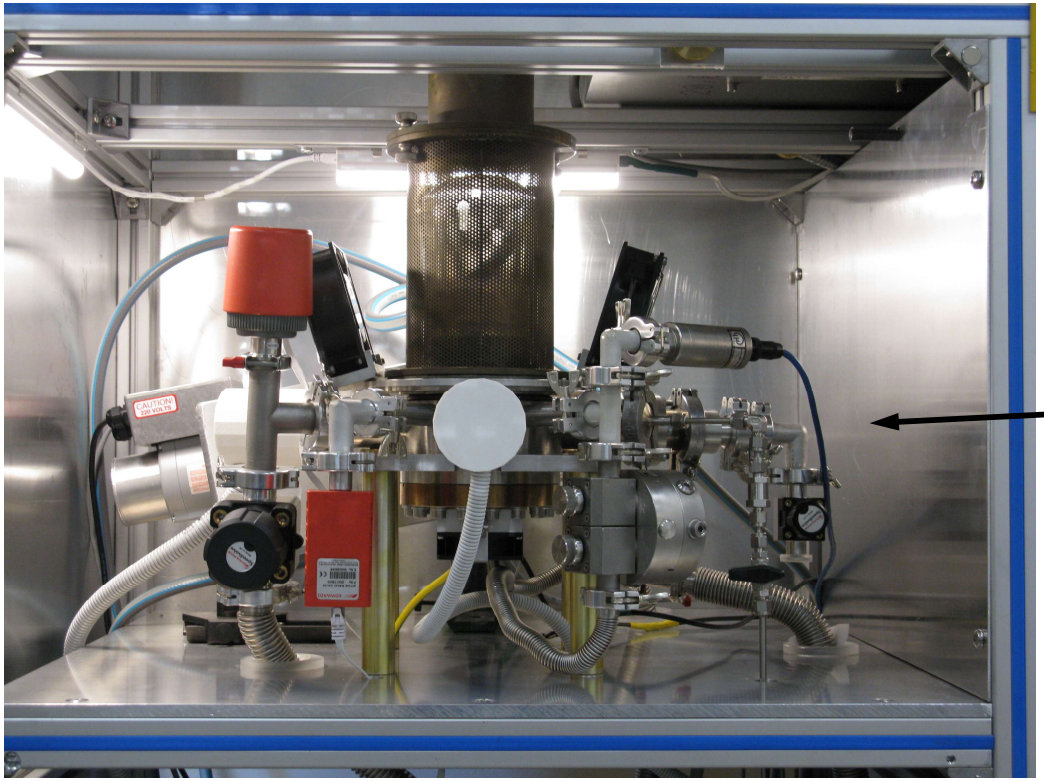
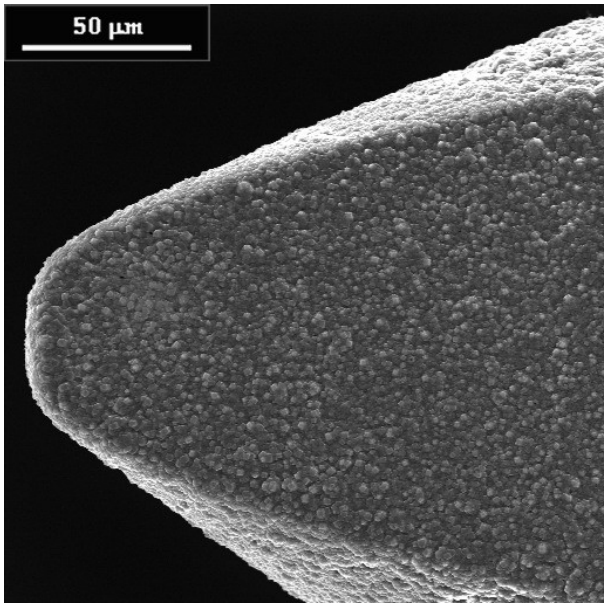
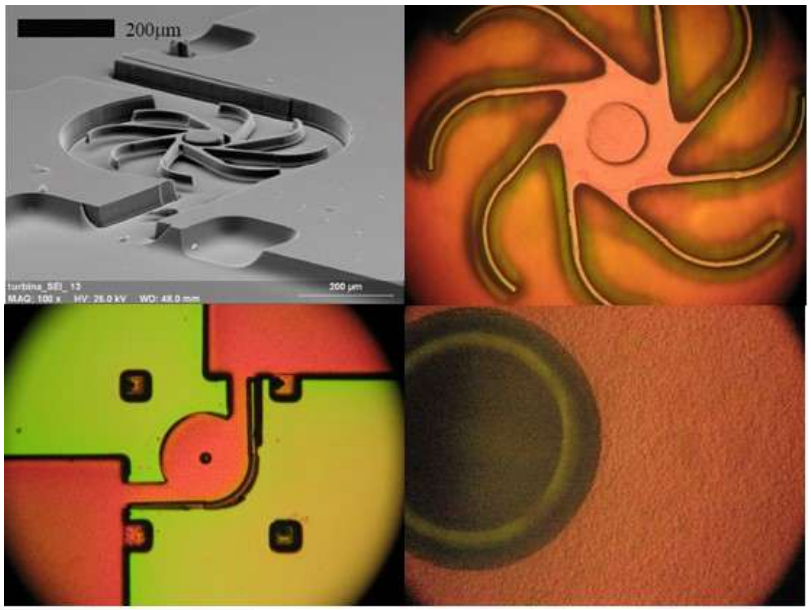
Synthesis of surface micro- and nanostructures



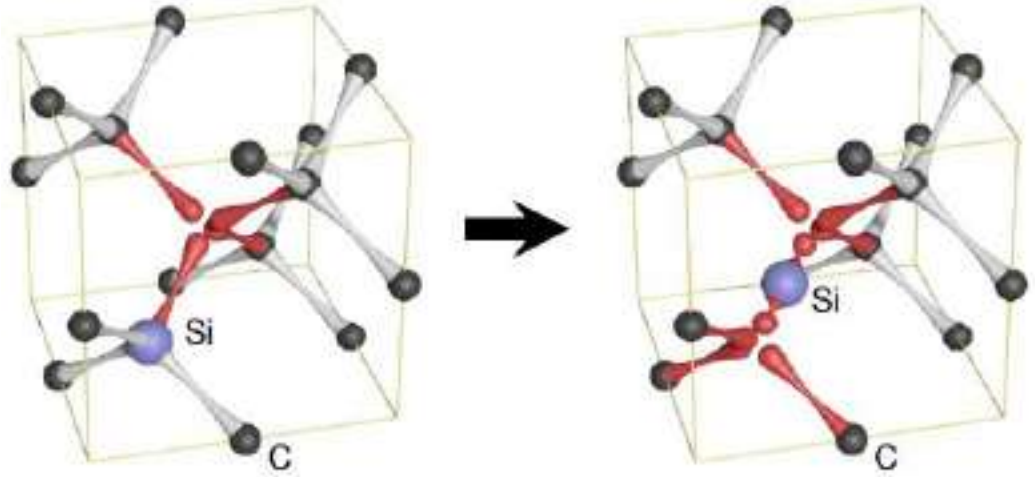
Synthesis of surface micro- and nanostructures

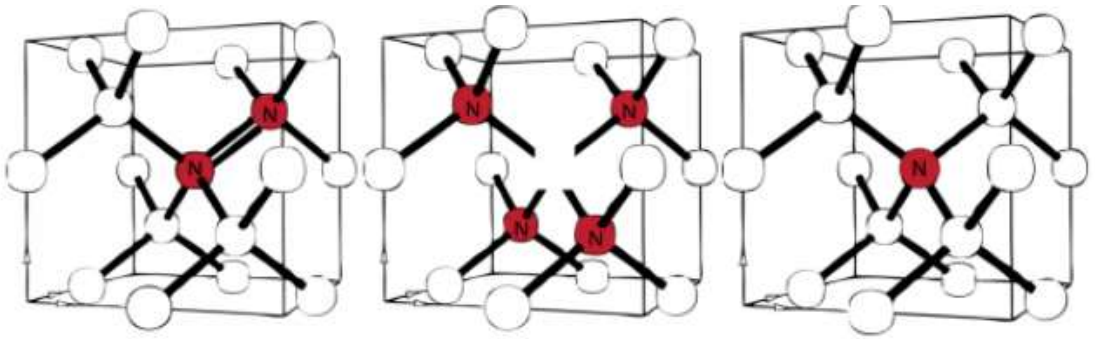
MEMS





Color Centers





Synthesis of surface micro- and nanostructures

Practical application of diamond layers

- Extreme hardness and heat conductivity
- Chemically inert and biocompatible
- High optical transmission
- Possibility of well-defined colour centres (SiV, NV)
- Applications in nanotechnology, semiconductor industry, sensorics, quantum optics, quantum informatics, photonic industry,

Thesis topics (B.Sc. & M.Sc.)

- **Analysis of doping materials as colour centres**
- **Plasmonic amplification of photoemission of nanodiamond structures with optically active defects**
- **Analysis of nanodiamond layers, as matrixmaterials for color centres**