

F4280 Technologie depozice tenkých vrstev a povrchových úprav Topics for bachelor/master theses

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CEITEC

Central European Institute of Technology
BRNO | CZECH REPUBLIC



Topics for bachelor/master theses

Atmospheric pressure plasma modification of surfaces

- ▶ investigation of atmospheric pressure discharges
 - ▶ glide arc with additives,
 - ▶ RF plasma slit jet as a wide atmospheric pressure plasma source
 - ▶ parallel-plate dielectric barrier discharge
- ▶ gas dynamics and electromagnetic field simulations, high speed camera imaging, optical emission spectroscopy for process diagnostics
- ▶ characterization of surface nanostructure and chemistry
- ▶ collaboration with industry Surface Treat a.s. <http://www.surface-treat.cz/>, SVV Centrum lepení Brno, PlasmaTreat (Germany)
- ▶ international collaboration (possibility for research/study stay abroad)
@ INP Greifswald - Dr. J. Schäfer (plasma jets), Université Libre de Bruxelles - prof. F. Reniers (PECVD in DBDs)

Atmospheric pressure discharges for non-conventional applications

- ▶ plasma medicine and plasma agriculture - international collaboration with Prof. Eun Ha Choi from Kwangoon University in Seoul
- ▶ synthesis of nanoparticles

Topics for bachelor/master theses

Plasma polymerization of bioactive thin films

- ▶ deposition of thin films with amine or carboxyl functional groups - active surfaces for immobilization of biomolecules, covalent attachment of drugs, improved cell adhesion
- ▶ understanding the process of deposition with the help of plasma diagnostics and molecular dynamic simulations
- ▶ characterization of prepared thin films and surfaces,
- ▶ immobilization of biomolecules mediating the cell adhesion (characterization using QCM, SPR sensors)
- ▶ interdisciplinary topic - collaboration with Fysiological Institute of Czech Academy of Sciences (Prague), biologists and biochemists at Masaryk University
- ▶ international collaboration: EMPA St. Gallen (Switzerland), University of Mons (Belgium), University of Bari (Italy), Osaka University (Japan)

Plasma deposition on micro/nano-porous materials

- ▶ coating of polymer nanofibrous meshes by bioactive plasma polymers or magnetron sputter-deposited antibacterial coatings
- ▶ investigation of penetration depth of plasma processes (deposition into nanofibrous polymer mats or microporous hydroxyapatite)
- ▶ international collaboration: EMPA St. Gallen (Switzerland), University of Bari (Italy), Osaka University (Japan)

Topics for bachelor/master theses

Development of carbon nanostructured materials

- ▶ growth of carbon nanotubes on non-conventional surfaces and materials
- ▶ tests of sample micromanipulation and adhesion strength of CNTs forests
- ▶ synthesis and transfer of graphene sheets
- ▶ industrial collaboration with FEI Czech Republic (Thermo Scientific) in Brno
- ▶ synthesis and characterization of graphene quantum dots and carbon nanoparticles

Topics for bachelor/master theses

Atomic layer deposition of multi-component materials

- ▶ ternary oxides or nanolaminates prepared by ALD
- ▶ high-k dielectrics for capacitors and memories, high refractive index optical materials (waveguides), active materials for gas sensors
- ▶ development of the deposition process (including deposition on high aspect ratio structures and inert surfaces such as CNTs)
- ▶ electrical and optical measurements, HRSEM, HRTEM
- ▶ ab-initio simulations of properties of new ternary materials
- ▶ international collaboration: University in Nantes (France), Montanuniversität Leoben (Austria)