

MATERIALS CHARACTERIZATION AND ADVANCED COATINGS RESEARCH GROUP

RESEARCH AREAS

Complementary fields of advanced coatings formation (using several different technologies) and its detailed characterization from macro down to nanoscale.

Development of novel approaches in material characterization, i.e. the combination of micro- and nanostructural studies, optoelectronic characterization of micro and nanostructures, tribology, Laser-Induced Breakdown Spectroscopy (LIBS), μ -CT, etc.

MAIN OBJECTIVES

The research capabilities of the group have already been demonstrated and should be performed onwards in the international context. Our main objectives are to react to recent trends and R&D activities in a broad range of scientific fields including aerospace, power industry, biology and electronics. The existing national and worldwide scientific cooperation will be further enhanced. A well-balanced research group should be created yielding quality results in basic research and strong cooperation with industrial partners in applied research.

CONTENT OF RESEARCH

Coatings for aerospace and automotive industries – diffusion coatings, thermal barrier coatings, etc.

Coatings for power industry - cavitation resistant coatings, wear resistant coatings, hydrophobic coatings for non-nuclear power industry, etc.

Coatings for biological/biomedical applications – protective coatings for biodegradable metallic materials with use for implants, etc.

For aforementioned activities, flame, twin wire arc, atmospheric plasma, high velocity oxyfuel spraying techniques are available.

Functional and/or decorative electro-deposited coatings.

Development of advanced coating production technologies, surface machining technologies, and surface interaction technologies with the aim of producing nonferrous lightweight metallic materials.

Specific testing areas of coatings and bulk material surfaces: tribology, cavitation test, isothermal and cyclic furnace oxidation tests, modified jet and burner rig corrosion-resistant test, corrosion tests, etc.

Micro- and nanoradiography and computed tomography (μ CT, nanoCT) techniques and their combination with other analytical approaches, esp. with LIBS and high-resolution 3D metrology.

Molecular degradation of lubricants, roughness behaviour within lubricated contacts, thin-film-lubrication studies under non-steady-state conditions, effect of proteins in biotribology applications.

Advanced structural and composition studies on metallic matrices, ultra-fine grain materials, nanostructured plasma and advanced coatings (especially using a combination of LIBS, microCT and tribology approaches).

Characterization of local structure inhomogeneities.

Improvement of diagnostic methods used for testing semiconductor materials and electronic components and structures.

Determination of correlations between the properties and the geometrical and structural parameters of nanostructures.

Low-frequency noise – analysis of bulk and interface defects, determining quality and reliability of electronic devices.

Development of highly sensitive sensor for detection of chemical substances dissolved in gases or liquids.

Experimental and theoretical research of stochastic processes and charge carrier transport as a basis for new advanced technologies.

Electromagnetic emission in dielectrics for the monitoring of the generation and growth of cracks under mechanical load.

Applied research for solutions to industrial problems.

Ongoing and planned participation in the other areas of the CEITEC research: biomaterials, materials for power industry, communication, ecology, and structural materials.

Including sub-groups:

- LIBS
- X-ray micro CT and nano CT
- Advanced Coatings
- Nano and micro Tribology
- Optoelectronic Characterization of Nanostructures

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For more information see also: <http://www.ceitec.eu/ceitec-but/materials-characterization-and-advanced-coatings/rg6>