



# Department of Physical Electronics

/ Faculty of Science / Masaryk University / Kotlářská 2, 611 37 Brno

INSTITUTE CONTACT



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## THEMATIC RESEARCH FOCUS

### RESEARCH AREA

- » Plasma Physics

### EXCELLENCE

- » Low temperature plasma physics

### MISSION

- » To be a leading Central-Europe educational and research institution raising high-quality professionals, and generating research results attractive for companies

## DEVELOPED TECHNOLOGIES

### CONTENT OF RESEARCH

- » Research of low-temperature plasma and ionized gases
- » Applications in technologies of polymer processing and thin layers (e.g. coatings of metals)
- » Plasma Enhanced Chemical Vapour Deposition
- » Plasma diagnostics, simulation

### MAIN CAPABILITIES

- » New methods for measuring the surface energy
- » „Plasma Pencil“ (a method of application for low-temperature plasma manufacturing technology) - USA patent
- » Technology of coplanar surface discharges (a common European patent Pegas Nonwovens - a world first in that technology into practice)

### Centre for Low-Cost Plasma and Nanotechnology Surface Treatment

- » Research and development of new methods for plasma surface treatment for textile, glass, automotive and other traditional industries and for manufacturing of high-tech products such as solar panels and battery separators

### FIELDS OF RESEARCH RESULTS APPLICATION

#### Basic research

- » Nanotechnology

#### Applied research

- » Plastics and chemical industry
- » Electronic industry
- » Construction-civil engineering
- » Paper industry
- » Wood industry
- » Textile industry
- » Chemical industry
- » Automotive industry
- » Air pollution treatment
- » Waste treatment
- » Water waste treatment
- » Energy - Exploration/Production
- » Materials: Iron and Steel; Plastics, Polymers; Glass, ceramics; Non ferrous materials; Building materials
- » Medical Treatment
- » Forestry and Wood



## NUMBER OF RESEARCH POSITIONS ↘

### SENIOR RESEARCH STAFF

8

### JUNIOR RESEARCH POSITIONS (INCL. PH.D. STUDENTS)

19

## KEY RESEARCH EQUIPMENT ↘

### LIST OF DEVICES

- » UVISEL Yobin-Ivon Ellipsometer
- » Microhardness meter Fischerscope H100
- » CCD spectrometers Yobin-Ivon
- » FTIR spectrometer
- » rf and mw generators

## BUDGET ↘

### TOTAL (MIL. CZK/ MIL. EUR)

42 / 1.68

### PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

0

### PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

0

## MAIN PROJECTS ↘

**2008-2011:** In-line plasma-treatments and surface nano-treatments of nonwoven fabrics (project 2A-3TP1/126 financed by the Ministry of Industry and Trade)

**2007-2011:** Deposition of thermomechanically stable nanostructured diamond-like thin films in dual frequency capacitive discharges (project GA202/07/1669 financed by the Czech Science Foundation)

**2005-2011:** Study and application of plasma chemical reactions in non-isothermic low temperature plasma and its interaction with solid surface (intitutional research plan MSM0021622411 financed by the Ministry of Education, Youth and Sports)

## ACHIEVEMENTS ↘

### Patents:

- » M. Černák: An apparatus and method for improving felting properties of animal fibres by plasma treatment. Patent PCT/CZ2009/000123
- » M. Černák: Method and apparatus for treatment of textile materials EP 1 387 90

## MAIN COLLABORATING PARTNERS ↘

### COLLABORATION WITH ACADEMIC PARTNERS

- » Institute of Plasma Physics, Academy of Sciences of the Czech Republic (Prague, CZ)
- » Institute of Physics of Materials, Academy of Sciences of the Czech Republic (Brno, CZ)
- » Institute of Physical Chemistry, Academy of Sciences of the Czech Republic (Prague, CZ)
- » Institute of Physics, Academy of Sciences of the Czech Republic (Prague, CZ)
- » Faculty of Mathematics and Physics, Charles University (Prague, CZ)
- » University of Greifswald (Greifswald, DE)
- » Technical University (Munich, DE)
- » Faculty of Chemistry, Technical University Brno (Brno, CZ)

### COLLABORATION WITH COMPANIES

- » SHM (Šumperk, CZ)
- » Pegas Nonwovens (Znojmo, CZ)
- » Preciosa (Nový Jičín, CZ)
- » Tonak (Nový Jičín, CZ)

## EXPECTATIONS ↘

### REQUIREMENTS

- » Cooperation with companies – based on a clear definition of the problem to be solved (e.g. surface treatment, thin film deposition, optical and mechanical analysis of thin films)
- » „Match-Making“ - connecting the solution of a business requirement with the implementation of quality research and publishing high-quality results

### OFFERS

- » Low-cost in-line plasma surface modification of flat materials as, for example, textiles, polymer films, aluminium foils, flat glass, etc.
- » Deposition of hard or protective layers
- » Measurement of the properties of thin films – mechanical, optical properties, chemical composition
- » Experience with cooperation on patenting and in commercial applications

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