

**Organisation:** *National Institute for Research and Development in Microtechnologies (IMT-Bucharest)*

**Web Page:** *www.imt.ro*

**Country:** *Romania*

**Main Activity:** *Research*

**Department/Laboratory/Group:** *Laboratory of Nanotechnology*

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**Profile:**

- The research activities carried on in Laboratory of Nanotechnology can be divided into three areas which are: Functional nanomaterials, Nanobiosystems, and Microelectromechanical Systems. The main research direction in Functional nanomaterials area is study of nanostructured silicon based or composite materials, from preparation to surface functionalisation and integration in complex systems. The Nanobiosystems area focuses on utilizing the various technologies developed in nanofabrication and MEMS to study and solve biological issues. Biomolecular patterns in microarrays, integration of sensing elements onto biochips for study of bioreactions, and implantation of active device elements in cells to study cellular biochemistry are examples of research activities being carried out. The Bio-Microelectromechanical Systems (Bio-MEMS) area focuses on the design, modeling / simulation and fabrication of new complex devices on silicon for applications in many interdisciplinary areas, and recently results in biochips, or microfluidic systems as laboratory-on-a-chip were obtained with applications in biomedicine and environmental monitoring.

**Participation to European Projects:**

- Laboratory of Nanotechnologies was involved in international projects and networks in the area of nanoscience and nanotechnology:

- S-E Europe Regional Network of Excellence Nanosciences and Multifunctional Materials (COSENT)(2002-2005)
- FP6-NoE: Nanostructured and Functional Polymer-Based Materials and Nanocomposites (NANOFUN-POLY) (2004-2008)
- FP6 - RIMDAC programme - Research Infrastructure for Microelectronics Development, Analysis and Characterisation, Project Porous silicon matrix for biomedical applications (2003 – 2004);
- FP5 - Network of Excellence on Nano-electronics (PHANTOMS) (2002-2004)
- Fp5 - EMERGE Programme Enhancing Microtechnological Education of young Researchers through Guest Experiments, Improving Human Potential Transnational Access To Research Infrastructures, Project Metallics - Fabrication of nanoelectrodes (2000 – 2002);
- Bilateral Romanian – Greek project , Porous silicon for biological and pharmaceutical applications (2006-2008);
- Bilateral Romanian – Italian Project , Nanostructured silicon for optical biosensors (2006-2008);
- Bilateral Romanian – French (Brancusi) Project , Selective growth of carbon nanotubes on silicon nanoelectrode array (2003-2005).

**ICT-2007.3.6: Micro/nanosystems competence / resources**

Micro/nano device technology

In our group are working 3 experienced researchers and 4 Ph.D students.

We have full access to IMT technological and characterisation facilities.

**proposal / interest**

- Miniaturised fuel cell devices using nanocomposite organic/inorganic membrane integrated into a microfluidic system for portable applications. The aim is to obtain a hybrid 3D system, miniaturized integrated fuel cell in a compact construction, a new concept in domain, with efficiency and autonomy in operation; The research directions approached in this area are:
  - development of new technologies to fabricate different types of functional nanocomposite membranes and the corresponding proton conduction model;
  - a new inorganic protonic membranes, on Si, that will be structurally stable and compatible with MEMS technology allowing advanced integration will be studied.

A new technology for heterogenic integration and 3D assembly of the transport system for membrane fuel supply incorporated on Si substrate and the auxiliary microfluidic system for water/fuel management on PDMS; a theoretical model of capillary effects that pump the fuel towards the cell's reaction sites will be proposed.

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