Center of Excellence in Nanotechnology.- Laboratory of Nanotechnology, IMT-Bucharest

The Laboratory of Nanotehnology was recognized at national level, and funded as a **Centre of Excellence in Nanotechnology.** and is affiliated as **Centre of Nanotechnology** to the **Romanian Academy** since 2001.

• **MAIN AREAS OF EXPERTISE:** 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 nano-structured 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 nano-fabrication 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.

• **INSTRUMENTS AND EQUIPMENT** Computers for simulation; instruments and software for electrical characterisation of nanostructures; Keithley model 6487-picoammeter/ voltage source- 2004; VOLTALAB10 and Trace Master 5; AMMT: Wet etching system with software for 4' silicon wafers, potentiostat MC, silicon etching power supply; Fluorescence set-up for LEICA DMLM with images acquisition and measurement system. We have full access to IMT technological and characterisation facilities.

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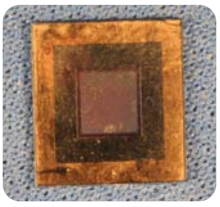

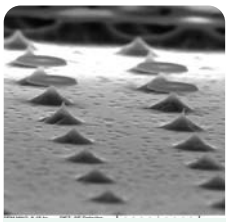

Field emission device

Some of the latest results are presented below:

Increase of the microprocessed silicon tips field emission efficiency, by localized deposition of the nano-structured materials in vacuum thermoionic arc

Achievements: It was realized a demonstrator consisting in a silicon chip with an array of microprocessed tips (the square in the middle of the chip) as cathode, and a gold ring used for chip bonding with the cover conductive plate as anode of the device. Measurements were performed in a vacuum deposition tool, 10-6 torr level for vacuum.

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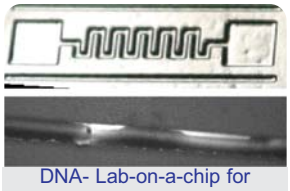
Partners: National Institute of Materials Physics; ROMES SA.



DNA- Lab-on-a-chip for genetic diagnosis

Development of new complex tools for protecting health: laboratory-on-a-chip system (TOOPROLAB)

The first type of device is dedicated to both optical and bioelectrochemical analyses of biological materials – different type of cells – subjected to external stimuli. The preliminary test structure contains an electrical circuit integrated in a microfluidic network, and fabrication of nano-electrodes on the reactor base determine the enhacement of sensitivity in electrochemical processes detection: The second type of device is designed to act as a micro-PCR (microreactor, resistor for thermal cycle, and temperature sensor) in connection with an microfluidic electrophoretic system for DNA separation (microchannel and microelectrodes).

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CELL-Lab-on-a-chip for in-vitro drug testing

RF-MEMS Center of Excellence.- Laboratory of micromachined structures, microwave circuits and devices, IMT-Bucharest

The laboratory is one of the promoters of the RF – MEMS topics in Europe, and is participating in the FP6 network of excellence **"AMICOM"** (2004 -2007). The laboratory was recognized at national level as **RF-MEMS Center of Excellence**, financed by the National Programme MATNANTECH (2002-2005).

• Main area expertise:

- Development of a new generation of circuits devoted to the millimeter wave communications based on the semiconductor (Si, GaAs, GaN) micromachining and nanoprocessing materials;
- Design and manufacturing of micromachined, passive circuits elements: inductors, capacitors, filters and antennae (endfire and broadband);
- Design and manufacturing of monolithically and hybrid integrated receiver front-ends based on silicon and GaAs micromachining;
- Design, modelling and manufacturing of reconfigurable millimeter wave circuits for wireless communication systems;
- Electromagnetic modelling of RF switches;
- Studies on magnetostatic wave resonators in microstrip and CPW configurations;
- Design, modelling and manufacturing F-BAR resonators on GaN membrane;
- MEMS and NEMS technologies development.

• International network participation:

Partner in the international network FP6 Network of Excellence "Advanced MEMS for RF and Millimeter Wave Communications"
coordinated LAAS-CNRS Toulouse/ Univ. Perugia

• Specific facilities:

Computers and software for microwave electromagnetic simulations (IE3D and Fidelity from ZELAND software packages); Vector network analyzer Hewlett Packard 0.1-18 GHz; Süss Microtech EP 4 prober; Access (by international cooperation) to millimeter wave on wafer measurements. At the end of 2006 the laboratory has obtained through a successful CEEX project (Module 4) acquisited a network analyzer with "on wafer" measurement system in the 0.1 -65 GHz range

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