



National Institute for R&D in Microtechnologies
Erou Iancu Nicolae 126A,
077190, Voluntari, Ilfov, Romania

Expression of interest **of IMT Bucharest to join a Consortium on HORIZON EUROPE calls**

[HORIZON-CL6-2024-FARM2FORK-01-2: Pioneering Innovation in Healthy and Sustainable Food Products and Processes.](#)

[HORIZON-CL6-2024-CLIMATE-01-1: Improving irrigation practices and technologies in agriculture](#)

[HORIZON-CL6-2024-BIODIV-01-2: Digital for nature](#)

[HORIZON-CL6-2024-CircBio-02-6-two-stage: From silos to diversity – small-scale bio-based demonstration pilots](#)

**Se trece denumirea completă a topicului, eventual și link-ul de referință.

Organization details:

*National Institute for R&D in Microtechnologies, Laboratory of Nanobiotechnologies, IMT Bucharest
Romania*

Key person: PhD. Mihaela Kusko, Head of Laboratory

PhD degree (2006) in physics / nanotechnology;

Her main research activities are in the field of nano(bio)technologies, from study of nanomaterials and nanostructures to their integration in complex devices. She was the leader of the Romanian team in the [FP7-NMP-2010-LARGE-4 Collaborative Project “Development of reference methods for hazard identification, risk assessment and LCA of engineered nanomaterials - NanoValid”](#) (2011-2015) and, in LIFE+ project (Environment Policy and Governance) “Development of an interactive tool for the implementation of environmental legislation in Nanoparticle manufacturers - [i-NANOTOOL](#)” (2013-2015), both in the nanosafety area. Over the last years, she has actively contributed to establish new research directions towards the applicative potential of nanomaterials /nanostructures /nanocomposites spanning from opto-electronics to biomedicine and energy harvesting, while guiding young researchers in master or doctoral studies who joined L1. Nowadays energy related components and devices become the leading domain of interest for M. Kusko, a special attention being dedicated to the ones involving electrochemical processes. Accordingly, silicon based nanosystems and microdevices were developed for electrochemical energy conversion and storage, in the frame of the Ideas and Partnership National research projects.

She currently leads a [Power Grid Modernization towards a More Stable Future-SuPriM](#), supported **by Norway, Iceland and Liechtenstein through the EEA and Norway Grants** (EEA and Norwegian Financial Mechanisms - [Energy Programme in Romania/ Renewable energy, energy efficiency and energy security](#)

call), as well as [a national project](#) (2021-2024) focused on engineering low dimensional heterostructures for boosting the performances of on-chip 3D energy storage / power delivery device.

Short description of the organization:

IMT Bucharest is an autonomous entity classified as a "national institute for research and development", therefore supervised and partially supported financially by the Ministry of Research, Innovation and Digitization (Romania). The activities are financed also based on competitive participation of the labs in an important number of national calls and EU funded programmes.

IMT infrastructure, mainly focused on development of devices, processes/ new materials with 3 clean room area class 1000, specific micro/ nanofabrication technology/characterization areas, is capable to support this project, as follows: (i) [Research Centre for Integrated Systems, Nanotechnologies and Carbon Based Nanomaterials](http://erris.gov.ro/CENASIC) (<http://erris.gov.ro/CENASIC>), with dedicated lab for chemical processes, including chemical synthesis/surface modification (class 1000/100-ISO 6/5), PECVD graphene growth); (ii) [IMT Support Centre for Micro- and NANO FABrication Characterization](http://erris.gov.ro/MINAFAB) (<http://erris.gov.ro/MINAFAB>) with specific equipments for physical-chemical evaluation of the prepared metallic nanostructures /3D hybrid nanoarchitectures (morphology, structure, crystallinity, size distribution, aggregation, surface chemistry, multilayers building-up, optical/electrical properties, hybrid interfaces/ interfacial processes), as well as for the enhancement evaluation of the prepared 3D platforms.

[Laboratory of Nanobiotechnologies](#) is focused on 4 research fields:

1. **Developing new functional nanomaterials** - preparation and characterization of metallic/ semiconducting nanoparticles, silicon-based nanocomposite materials, and respectively polymeric multilayer structures, looking also to appropriate surface functionalization:
-**Silicon nanostructuring** and its **appropriate internal surface functionalization** allows development of biomedical applications, like high sensitive layer for [biosensors](#) or substrate for [protein](#) and [DNA](#) microarray technology.
- **nanocomposite structures** like metallic nanoparticles / carbon nanotubes dispersed into porous silicon matrix consist the base for novel substrates for [SERS / SEIRS biodetection](#), [cold electron emitters](#) and [electrocatalytic membrane based on silicon](#).
2. **Medical nanostructures** include: implantable silicon based integrated drug delivery microdevices (DESIRE project), in-situ nanodevices for drug delivery like [Si based carriers](#); Au nanoparticles for selected cell destruction (e.g., hyperthermia in cancer treatment), imaging and diagnostic;
3. **Advanced characterization methods** for nanoparticles analysis in different stages of their life cycle. The basic idea and concept behind is the observation that (1) the physicochemical properties of nano-sized particles, and hence their biological activity, are distinct from those of the same bulk materials and often unpredictable, and that (2) the existing methodology for measurement and testing is only to a limited extent applicable to nanoparticles.

The [nanostructure, size distribution and surface charge distribution](#) of nanomaterials will be analyzed and correlate with their interactions with other molecules (bioaccumulation of organic contaminants) to achieve [sustainable solutions for nanotechnology - based products](#).

Relevant publications:

1. I.-N. Bratosin, C. Romanitan, G.Craciun, N. Djourellov, M.Kusko, M. C. Stoian, A. Radoi, Graphitized porous silicon decorated with cobalt hexacyanoferrate nanocubes as hybrid electrode for high-performance supercapacitors, *Electrochimica Acta*, 2022. <https://doi.org/10.1016/j.electacta.2022.140632>.
2. Bratosin, I.-N., Varasteanu, P., Romanitan, C., Radoi, A., Kusko, M., In-Depth Analysis of Porous Si Electrodes for Supercapacitors, *J. of Physical Chemistry C*, 2021, 125(11), 6043–6054. DOI: [10.1021/acs.jpcc.0c11035](https://doi.org/10.1021/acs.jpcc.0c11035).
3. Exploring the impact of MoS₂ on the performance of the planar solid micro-supercapacitor Varasteanu, P., Romanitan, C., Bratosin, I., ...Radoi, A., Kusko, M., *Materials Chemistry and Physics*, 2021, 265, 124490.
4. I. Mihalache, A. Radoi, R. Pascu, C. Romanitan, E.Vasile, M. Kusko, Engineering Graphene Quantum Dots for Enhanced Ultraviolet and Visible Light p-Si Nanowire-Based Photodetector, *ACS Appl. Mater. Interfaces* 2017, 9, 34, 29234–29247. <https://doi.org/10.1021/acsami.7b07667>
5. L. Gogianu et al., Microarray Biochip Fabricated on Silicon Nanowires/ Carbon Dots Heterostructures for Enhanced Viral DNA Detection, *Applied Surface Science* 636:157878. DOI: [10.1016/j.apsusc.2023.157878](https://doi.org/10.1016/j.apsusc.2023.157878)
6. A. Boldeiu et al., Comparative analysis of honey and citrate stabilized gold nanoparticles: In vitro interaction with proteins and toxicity studies, *Journal of Photochemistry and Photobiology B: Biology* 197, 2019. <https://doi.org/10.1016/j.jphotobiol.2019.111519>

Relevant projects:

- [FP7-NMP-2010-LARGE-4 Collaborative Project “Development of reference methods for hazard identification, risk assessment and LCA of engineered nanomaterials - NanoValid” \(2011-2015\)](#);
- LIFE+ project (Environment Policy and Governance) “Development of an interactive tool for the implementation of environmental legislation in Nanoparticle manufacturers - [i-NANOTOOL](#)” (2013-2015);
- **COST (European Cooperation in the field of Scientific and Technical Research) Project - “Raman-based applications for clinical diagnostics (Raman4clinics)” (2014-2018)** - IMT resp. Dr. Mihaela Kusko http://www.cost.eu/COST_Actions/bmbs/Actions/BM1401;
- Bilateral Cooperation Project Romania – Argentina (Instituto de Investigaciones en Físicoquímica de Córdoba (INFIQC), Departamento de Química Orgánica. Facultad de Ciencias Químicas, Universidad Nacional de Córdoba) – „*Development of analytical methods based on supramolecular systems to detect and quantify nanomaterials – DAMS*” (2013 – 2015);
- MNT ERA-NET project – “*Nanostructural carbonaceous films for cold emitters – NANOCAFE*” (2009-2011);

- MNT ERA-NET project – “A ‘*system-in-a-microfluidic package*’ approach for focused diagnostic DNA microchips – DNASiP” (2008-2010);
- Engineering low dimensional heterostructures for boosting the performances of on-chip 3D energy storage / power delivery device (2021-2023);
- Towards portable nanoplastic detection system by harnessing the plasmonic hot spots potential using advanced optical platforms (2022-2024);

For more info, please visit: <https://www.imt.ro/organisation/research%20labs/L1/index.htm>

Contact persons:

E-mail: mihaela.kusko@imt.ro

Senior researcher: PhD. Adina Boldeiu

E-mail: adina.boldeiu@imt.ro