



## PARTNER PRESENTATION AND INTEREST IN HORIZON EUROPE PARTICIPATION

<b>Name of the organisation</b>	<b>National Institute for R&amp;D in Microtechnologies, IMT Bucharest</b>
<b>Country</b>	Romania
<b>Type of organisation</b>	Research
<b>Short description</b>	R&D in micro-nanoelectronics, photonics, micro-nano-systems (MEMS, NEMS, MOEMS, RF-MEMS, MNBS), micro and nano-fabrication technologies and new materials
<b>Laboratory/</b>	<b>Micro and Nano-Photonics Laboratory</b>
<b>Contact person</b>	Dr. Roxana Tomescu
<b>E-mail</b>	roxana.tomescu@imt.ro

### Short description of Laboratory

**Mission:** *Research, development and education in micro and nanophotonics*

#### Research domains:

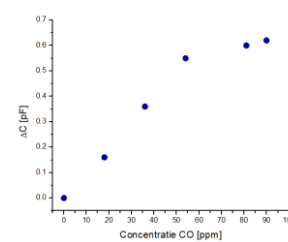
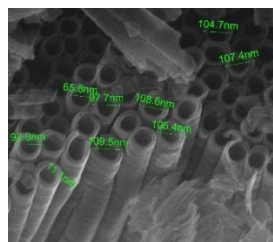
- **Modelling, simulation and CAD of micro and nano-photonic structures** (optoelectronic devices and photonic integrated circuits; plasmonics; OMEMS).
- **New materials for micro-nanophotonics** (hybrid nano-composites with controlled optical properties, transparent semiconducting oxides, Graphene, quantum dots) **and new processes and devices.**
- **Micro-nano photonics components** (photodetectors, photonic integrated circuits, metasurfaces, plasmonic structures, DOE, optical components);
- **Organic optoelectronics** (devices based on graphene-polymer nanocomposites)

**Applications:** *Optical sensors; Security elements for anti-counterfeit protection and logistic monitoring (holographic labels with extra security nanoelements, RFID elements and temperature sensor); Free space optical communications; Beam shaping; Quantum technologies.*

#### Expertise in the specific field of the selected call

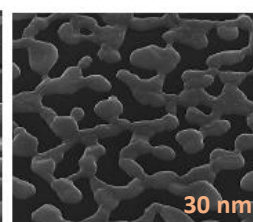
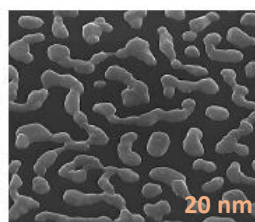
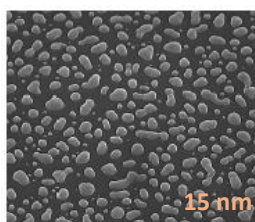
- Development of sensor collaboration with industrial partners

#### 1. Gas sensor based on TiO<sub>2</sub> nanotubes



- Nanotubes realization optimized with Design of Experiment (DOE) method.

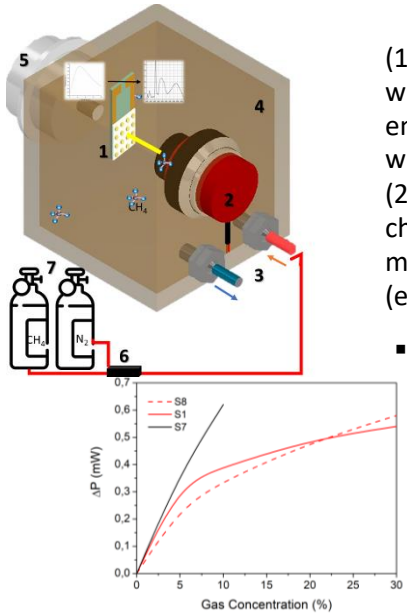
#### 2. Fluorescent based sensitive structures for biosensors applications



- Thermal annealed Ag layers: thicknesses of 15, 20 and 30 nm.

- Fluorescent enhancement on large areas (low-cost processes for cheap platforms) based on plasmonic metasurfaces.
- Biosensing applications in the visible spectral domain.
- The metasurfaces offered an enhancement of 423 folds.

### 3. Gas sensor based on a narrow band IR metamaterial emitter integrated with a resistive heater



(1) micro-IR source based on metamaterial “perfect” absorber integrated with a micro-heater for selective gas sensing; adjusts the broad band emission of the microheater into a narrow and high intensity emission band with the center wavelength overlapping the absorption peak of test gases; (2) thermopile detector; (3) two gas plug-ins (inlet and outlet); (4) gas chamber, where a mixture of inert gas (N<sub>2</sub>) and a test gas is purged; (5) manometer; (6) mass flow controller for mixing nitrogen with toxic gases (e.g., CH<sub>4</sub>, CO<sub>2</sub>) in different concentrations; (7) inert and test gases tanks.

- The **modification of the spectral response of metasurface-based structures** is easily achieved by adapting the geometrical parameters of the plasmonic micro-/nanostructures in the metasurface.
- Changes in radiant power when different concentrations of CO<sub>2</sub> gas are introduced in the sampling chamber

#### Involved persons. Short CV

**PhD. Eng. Roxana Tomescu** – Master Degree in Optoelectronics (2012) and a PhD in Electronics, Telecommunications and Information Technology (2015) Her main expertise is in: *design and simulations of nano-optics, metasurfaces, plasmonics, nano-antennas*, micro and nano-photonics and optoelectronic devices for sensing applications; *SNOM, AFM and Raman* characterizations; *technological flow* for micro and *nanofabrication*.

**PhD. Catalin Parvulescu** Ph.D (2015) in Electronics and Telecommunications. Expertise in *photolithography processes, processing and characterization of photosensitive films, wet etching, nanoimprint lithography processes, bonding processes, microfabrication processes for microfluidics*.

**PhD. Dana Cristea** (senior researcher) - PhD in Optoelectronics and Material for Electronics from University Politehnica of Bucharest, head of Microphotonics Laboratory; main area of expertise are: *micro-and nano-photonic devices, integrated optics, micro-optics, plasmonics, chemo-bio-sensors with optical read-out (design, processing and characterization)*; *coordinator of more than 25 national and international projects* (FP6, FP7, H 2020) in the area of photonic devices and sensors, coordinator of projects for technology transfer to SMEs.

#### Interested in the calls and the *potential contribution*.

- **HORIZON-CL4-2023-DIGITAL-EMERGING-01-57: Advanced imaging and sensing technologies (IA)(Photonics Partnership)**

Development and realization of sensitive platforms with enhanced fluorescence to **enable diagnosis and screening** for **health** applications.

- **HORIZON-CL4-2023-RESILIENCE-01-33: Smart sensors for the Electronic Appliances market (RIA)**

Development of highly selective gas sensors for **environmental monitoring**;

Development of **advanced materials** which **allow the capturing of chemical and bio-chemical signals** with extended lifetime and **extreme low cost**.

- **HORIZON-CL4-2023-DIGITAL-EMERGING-01-51: Pervasive photonics - multi-technology integration for digital infrastructure, sensors and internet of things (Photonics partnership)(RIA)**

Development and realization of micro-nano photonics components (photodetectors, photonic integrated circuits, metasurfaces, plasmonic structures, DOE, optical components) for **co-integration of photonics and microelectronics on single or multiple die ('chiplet' approach)**.

#### Have you already participated in an EU funded project? If so, provide some references/ results.

- **MIMOMEMS**- European Centre of Excellence in Microwave, Millimetre Wave and Optical Devices, based on Micro-Electro-Mechanical Systems for Advanced Communication Systems and Sensors, REGPOT -Contract no. 202897- **design, fabrication and characterization of plasmonic nanostructures**.
- **FlexPAET**- Flexible Patterning of Complex Micro Structures using Adaptive Embossing Technology, IP, NMP- algorithms for the optimization **high volume production of large-area masters micro structured surfaces for diffractive optical elements**
- **WAPITI**- Waferbonding and active passive integration technology and implementation ()- STREP FP 6 /IST - **design and 3D simulation of microring resonator, all-optical wavelength converters, multifunctional devices**.