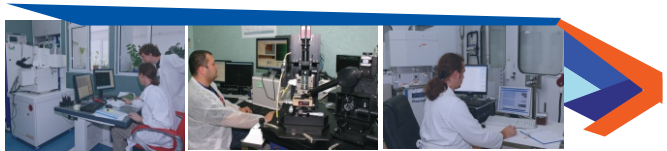
EUROPEAN UNION GOVERNMENT OF ROMANIA Structural Instruments 2007-2013

# Extending the existing experimental infrastructure: IMT-MINAFAB

CENASIC research centre will incorporate also part of the existing experimental infrastructure. The new 200 $m^2$ clean room will extend one of the existing ones (see photo below), whereas the new investment will be included into IMT-MINAFAB.

*Part of the existing clean room, with equipments for chemical deposition from the vapor phase in plasma and for bulk micromachining – to be included CENASIC.*

IMT centre for MIcro- and **NAnoFABrication** (IMT-MINAFAB) was **the first "open" research infrastructure in this field from Eastern Europe** (2009), providing access for research, education and industry, see www.imt.ro/MINAFAB. IMT was **the only organization from this region** selected to participate to **EUMINAfab2**, a proposal for a network of "**advanced nanofabrication**". What is essential behind the participation of IMT in a proposal aiming at "*integration and opening of essential European infrastructures*", it is the scientific expertise of researchers operating most of the more complex equipments (see also the presentation of R&D laboratories on www.imt.ro).



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# About CENASIC

## *Possible cooperation.*

Partnership with other research organizations and industrial companies, especially in the areas of SiC and diamond is highly required. IMT is also interested to apply for ERA-Chair and Twinning within the future calls of "Horizon 2020".

***Recruiting scientific personnel.*** While maintaining at least 33 existing technical positions, the CENASIC project is creating 10 new research positions 5 of them for foreign scientists. Highly skilled personnel is required.

The "philosophy" of CENASIC project is the continuous investment in growing of human potential, by offering access to the new and existing R&D equipment and facilities, developing new partnerships with foreign scientists within the EU and creating new employment opportunities in an international environment.

***Contact. For any questions related to technical cooperation or job description, send a message at cenasic@imt.ro.***

## Key people for project implementation:

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Sectorial Operational Programme
"Increase of economic competitiveness"
"Investments for your future"
Project co-financed by European Regional Development Fund

Research Centre for Integrated Systems Nanotechnologies and Carbon Based Nanomaterials

# CENASIC

a new centre in

## Carbon Based Nanomaterials

www.imt.ro/CENASIC

**Contract no.254/2010**
**Cod SMIS-CSNR: 14040**

**National Institute for R&D in Microtechnologies- IMT Bucharest**
www.imt.ro

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# Research Centre for Integrated Systems Nanotechnologies and Carbon Based Nanomaterials

## a new centre in Carbon Based Nanomaterials

### What is CENASIC?

The **Research Centre for Integrated Systems Nanotechnologies and Carbon Based Nanomaterials (CENASIC)** is a project devoted to the creation of a modern research center focused on applied research, involving highly specialized techniques and experienced researchers. This strategic investment allows access to new equipments, laboratories and state-of-the art technology fully integrated into the existing IMT infrastructure.

CENASIC provides an investment of 6 M Euro in building, facilities and equipments (in use **November 2015**). The new building has approximately 1000 $m^2$, including 4 levels: the clean room (ground floor), technical level, 2 levels for labs and offices. The 8 experimental laboratories (new or reinforced) will complete technological process in order to develop products and services described in the project.

The **list of these experimental laboratories is:**

- Lab for Processing of Carbon based Nanomaterials and Nanostructures
- Lab for Thermal Processes
- Lab for Graphene technology
- Lab for Chemistry of Hybrid Interfaces
- Lab for Thin Layer Spectrometry
- Lab for Electro-mechanical Processes and Sample Preparation
- Lab for Electromechanical Testing & Reliability
- Laboratory for Simulation and design for carbon-based MEMS/NEMS.

The **key new technological equipments** within the CENASIC labs will be:

- Multiprocess Furnace System (Furnance)
- Molecular Beam Epitaxy (MBE)
- Plasma Enhanced Chemical Vapor Deposition (PE CVD),
- Atomic Layer Deposition tool (ALD)
- RF Magnetron Sputtering.

### Main technological equipments in CENASIC

and their role (in red-other materials than grahene).

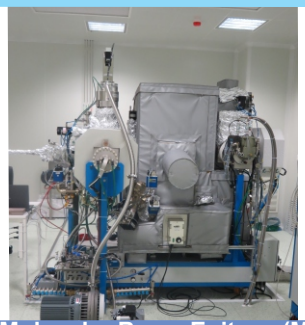
RIE (Reactive Ion Etching) existed before CENASIC.

| | |
|---|---|
| PE CVD | Graphene growth, diamond-like carbon growth, thin films of diamond, SiC thin films |
| MBE | Graphene growth, GaN/ graphene heterostructure growth |
| Furnace | Graphene substrates such as $SiO_2$ thermally grown |
| RIE | Graphene patterning |
| ALD | Graphene insulating oxide |
| RF Sputtering | Graphene oxide electrodes |

Graphene devices technology flow

Equipments for growth carbon based materials

Equipments for processing carbon based materials



Molecular Beam Epitaxy (MBE)

RF Magnetron Sputtering

### CENASIC present and future research activities

CENASIC aims to develop partnerships and collaborations in the area of micro-nanotechnologies, targeting the development of new technologies based on dedicated carbon materials: **SiC, graphene and nano-crystalline diamond**. The **thematic priority** is Innovative Materials, Processes and Products (according to the National RDI Programme 2007-2013, the contract for financing was signed in 2010).

**Present (October 2015) exploring activities of the CENASIC research group:**

- graphene monolayer growth at the wafer level (3 and 4 inches);
- transfer of graphene on solid and flexible substrates;
- fabrication of graphene based nanomaterials: aerogel, reduced oxide graphene, graphene oxide;
- the integration of graphene with other two dimensional materials such as $MoS_2$, $WS_2$, BN and fabrication of van der Waals heterostructures;
- shielding cables based on graphene based materials;
- nanoelectronic and nanophotonic devices based on graphene.

**Expected future directions of IMT research related to CENASIC**

- Vapour, temperature and pressure sensors based on graphene;
- GaN devices such solar cell, transistors for high temperature operation;
- Biosensors for DNA hybridization detection;
- SiC gas sensor for harsh environments;
- Diamond thin films for high power electromagnetic.