



**European Network on New Sensing Technologies for Air
Pollution Control and Environmental Sustainability - *EuNetAir*
COST Action TD1105**

WGs and MC Meeting at Rome, 4-6 December 2012

Action Start date: 01/07/2012 - Action End date: 30/06/2016

Year: 2012-2013 (*Starting Action*)



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WG1 member, MC substitute

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INCDMNR-IMNR/Romania

Scientific context and objectives in the Action

WG1: work plan objectives

1. Protocols for synthesis of gas sensitive nanomaterials.
2. Protocols for synthesis of functionalized nanostructures for enhanced gas detection at part-per-billion (ppb) level, stability and selectivity.

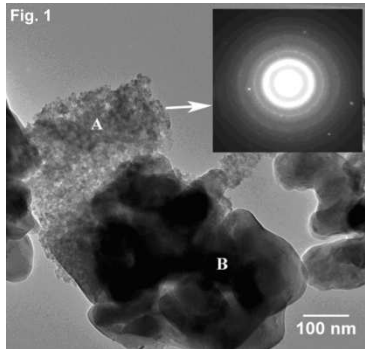
WG1 – Deliverables

Overview of the current state-of-the-art on gas sensor materials and advanced nanostructures.

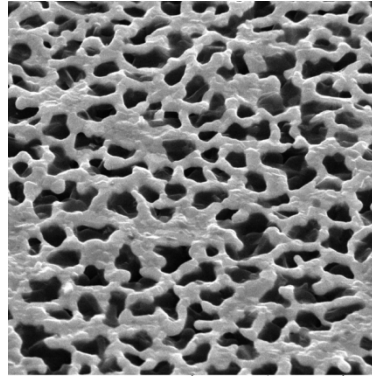
IMNR contribution:

- IMNR has expertise in chemical synthesis (hydrothermal) of the nanostructured materials, hydrothermal-electrochemical deposition on different substrates and spin-coating nanostructured films.
- IMNR can contribute by hydrothermal functionalisation of carbon nanotubes and graphene.
- IMNR is involved in WG1: Sensor Materials and Nanotechnology and in Ad-Hoc Group : Dissemination
- IMNR will contribute with an overview of the current state-of-the-art of the chemical procedure to manufacture gas sensor materials and nanostructures.

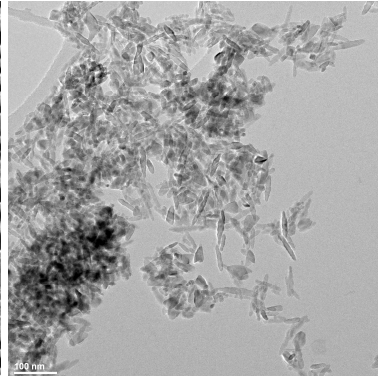
Current research activities IMNR (1/2)



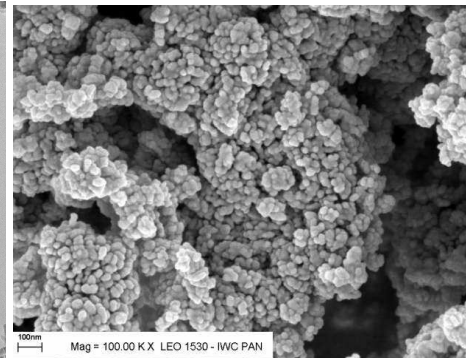
BaSrTiO₃



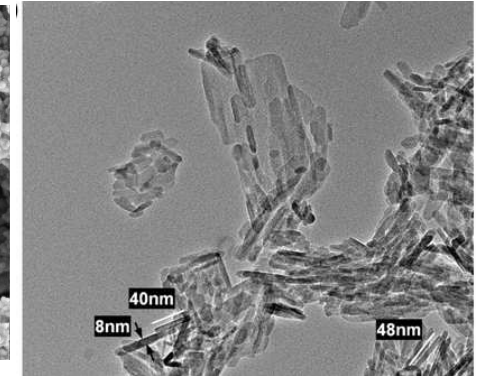
Si/SiO₂/Pt/BST
BST film



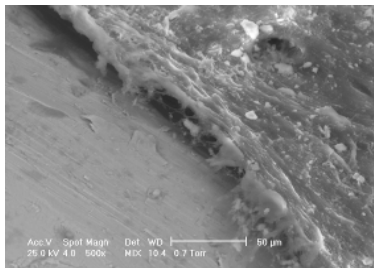
Co doped TiO₂



Co doped ZnO



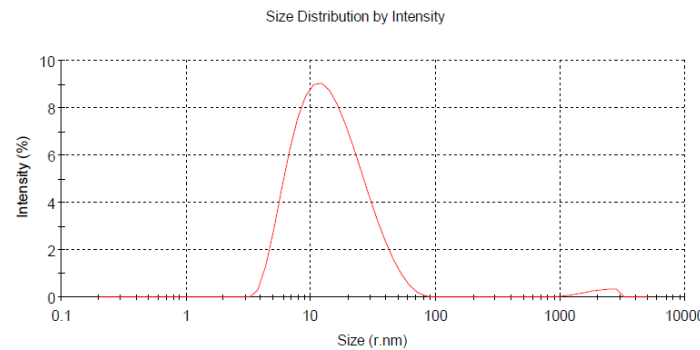
HRTEM image of
HAP-PU composites
at high pressure



IN VIVO Tests on
Hydrothermal-
electrochemical
depositions,
HAp-maleic polymer



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



Ag doped ZnO: 12.3 nm; pdl: 0.258



Ag doped ZnO bandage, on the
market. IMNR has a joint Patent
with VELFINA S.A.



Current research activities IMNR (2/2)

Chemical process – hydrothermal method

- **Medicine (imagistic area – brain cancer, regenerative medicine – bone fillers, patches for burned skin - product on the market).
Nanoencapsulation for energy applications.**
- **Thin films based on transition metals doped ZnO and TiO₂ (MEMS)**
- **Textile – self cleaning textile, flame retardant used in leather industry.**
- **Doped BST based thin films used in gas sensors for NH₃, SO₂, H₂S**
- **Carbon graphite functionalization for energy storage application.**

On going projects.

Research Facilities IMNR (1/2)

Research Facilities:

**New Centre for Intensification of Metallurgical Processes at High Pressures & Temperatures –High PT Met
Project financed by Structural Funds for Research Infrastructures**

**High pressure
Research
Infrastructure**

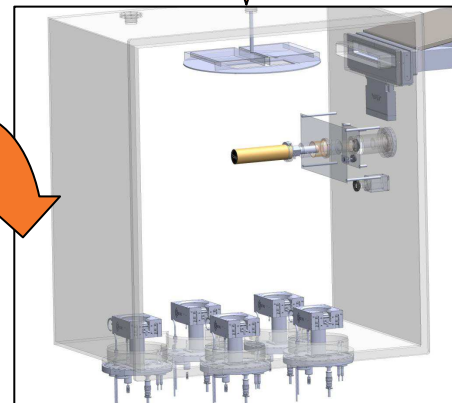


Autoclave high capacity



Spray-
dry

**High Temp.
Research
Infrastructure**



5-electron guns furnace

Research Facilities IMNR (2/2)



Hydrothermal system high capacity autoclave



Controlled atmosphere Oven – MHI



Zetaseizer Malvern



DSC Netzsch Maya F200



AAS ZEE nit 700
Analytik Jena



Scratch test Nanovea



D8 XRD Bruker diffractometer

Suggested **Priorities** for future research

Research directions as PRIORITIES:

- **Sensing materials synthesis (chemical, physical methods)**
- **Mechanism at the interface between perovskite sensor and gas should be more investigated and assessed. (e.g. doped BST)**
- **Functionalisation of Carbon nanotubes or Graphene using hydrothermal method**
- **Thin films deposition for sensor application.**

Innovation:

- **Modeling materials properties and mechanism at the interface between the sensing material and gas will allow establishment of complex correlations of the whole value chain synthesis method – materials properties and application in gas sensor.**