European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir* COST Action TD1105 1<sup>ST</sup> TRAINING SCHOOL Universitat de Barcelona, Spain, 13 - 15 June 2013

organized by UB, MIND-IN2UB - Dept. of Electronics and CSIC-IDAEA

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

Year 1: 2012 - 2013 (Ongoing Action)



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# Expertise of the Trainee related to the Action

- Conductometric gas sensors
- Microelectronic devices fabrication
  - UV photolithography
  - Sputtering
- Characterization techniques
  - X ray difraction
  - Profilometry
- Surface analysis: SEM and FIB microscopes



# **Current research activities of the Trainee (1/2)**



**Conductometric gas sensors** 



#### **Gas quality sensors**





**Nanowire growth** 



**Electrochemical sensor** 

# **Current research activities of the Trainee (2/2)**

- Development of new approaches (nanostructuration, photostimulation, single nanowires) to obtain enhanced MOX (SnO2, ZnO y NiO) resistive sensors
- Sensor characterization:
  - Determine the effect of the fabrication parameters on the physical and optical properties
  - Electrical measurements under low concentrations of benzene, formaldehyde, carbon monoxide and nitrogen dioxide
- Characterization of nanostructured MOX using photoactivation and thermal activation
- Integration of the new nanostructured MOX into developed microsensing platforms
- Integration of the sensing modules in common platforms with shared data processing and embedded electronic instrumentation.



OSHA* limits	STEL	Action level
Formaldehyde	2ppm	500ppb
Benzene	5ppm	500ppb
Nitrogen dioxide	1ppm	300ppb
Carbon monoxide	125ppm	20ppm

\*OSHA= Occupational Safety and Health Administration

## Achieved RESULTS and future activities



Annealing Temperature: 700°C



## Achieved RESULTS and future activities



# **CONCLUSIONS**

- Sensor able to detect low concentration of toxic gases
- Simplicity to grow nanostructures
- Nanostructures growth just over the electrodes
- Reacts to different target gases  $\rightarrow$  No selective
- Future work:
  - Improve selectivity
  - Reduce drift
  - Material characterization

