



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

COST Action TD1105

1ST 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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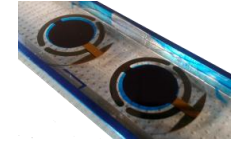
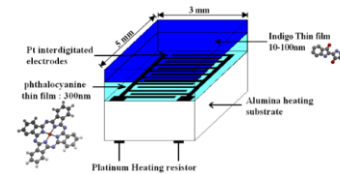
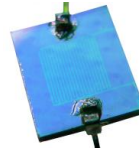
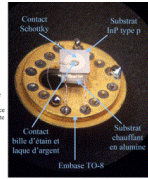
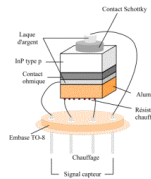
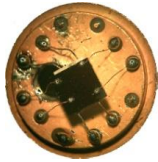


Expertise of the Trainee related to the Action

- Elaboration of sensor material based on CNTs (carbon nanotubes)
- Chemical (covalent and non-covalent) functionalisation of CNTs preparation and characterisation of hybrids CNTs materials
- Preparation of dispersions based on CNTs
- Performance study of CNTs and hybrids CNTs-based sensors for the detection of pollutants (O_3 , NO_2 , CO ; VOC: BTX, VFA)
- Fabrication of resistive (IDE's) and mass sensors (QCM)
- Elucidation of the sensing mechanisms using multi-transduction modes

Current research activities of the Trainee (1/2)

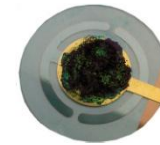
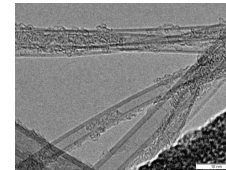
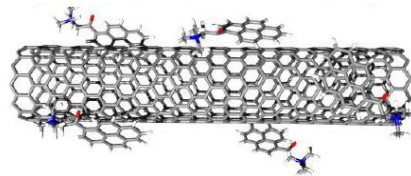
- Organic/inorganic semiconductor-based gas sensors



- Functionalized nanocarbons for sensor applications

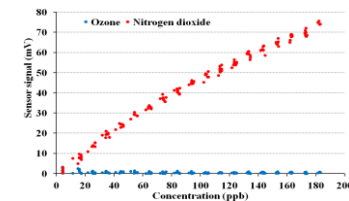
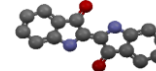
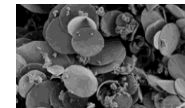
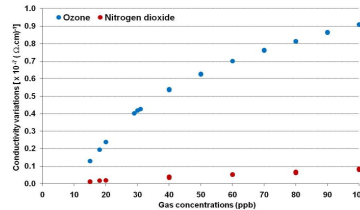
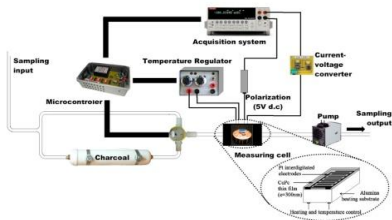


Adding CNTs
+ sonication



IDE's coated
with CNTs/MCs

- Chemical filters and working protocols for selective detection



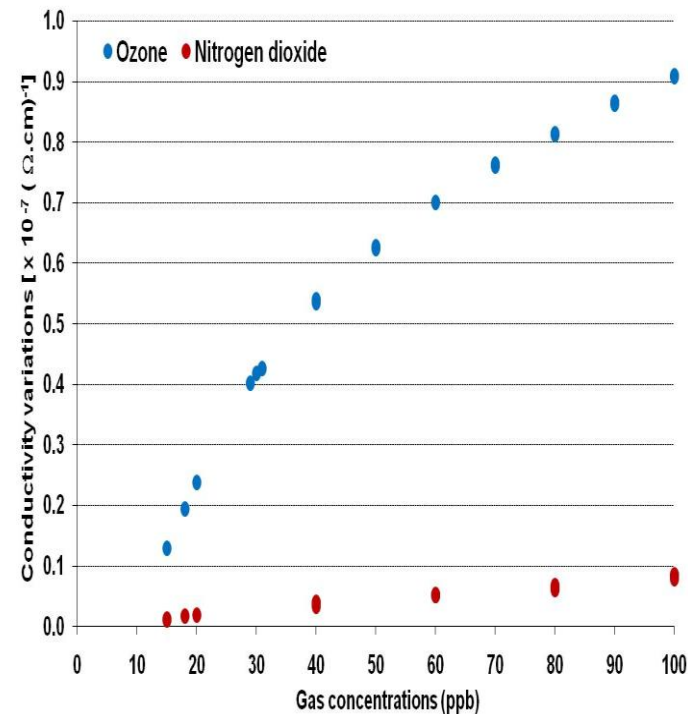
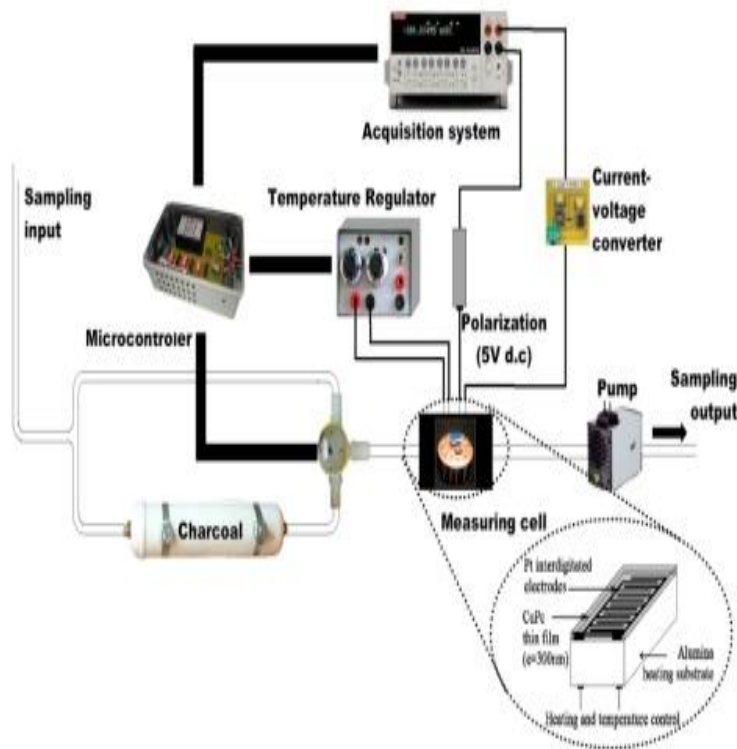
- ✓ Gas sensors for BTX (National project)
- ✓ VFAs monitoring by original sensing devices

Ongoing research activities of the Trainee (2/2)

- **Characterization of interactions involved between organic/inorganic materials and gases**
- **Development of sensitive and selective sensors for low gaseous pollutant concentrations**
 - ☑ Optimization of the preparation of sensors materials
 - ☑ Identification of sensing mechanisms
- **Optimization of a workbench dedicated to VFA detection (in solution)**
 - ☑ identification and preparation of sensing materials for electrochemical detection

Achieved **RESULTS** and future activities

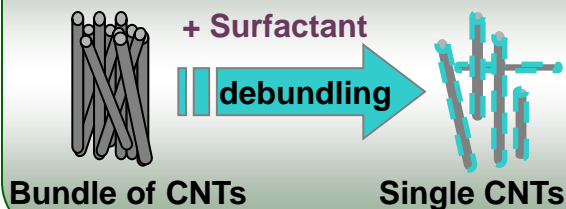
Chemical filters and working protocols for selective detection



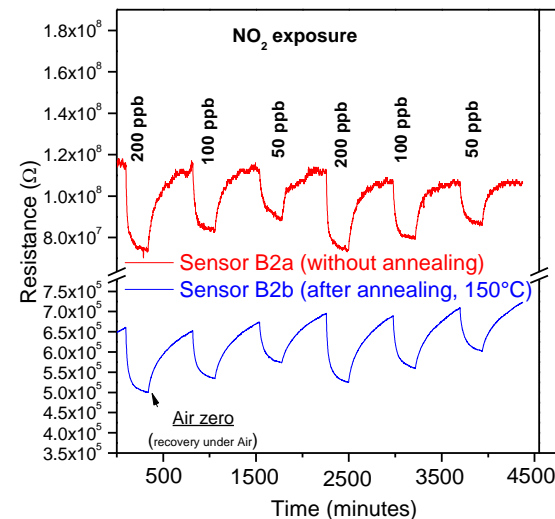
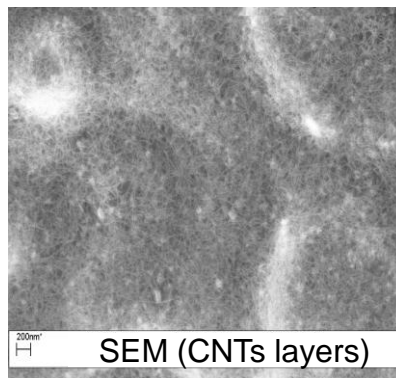
Achieved **RESULTS** and future activities

Use of the dispersion methods for the elaboration of CNTs-based sensors: detection of NO_2 and O_3

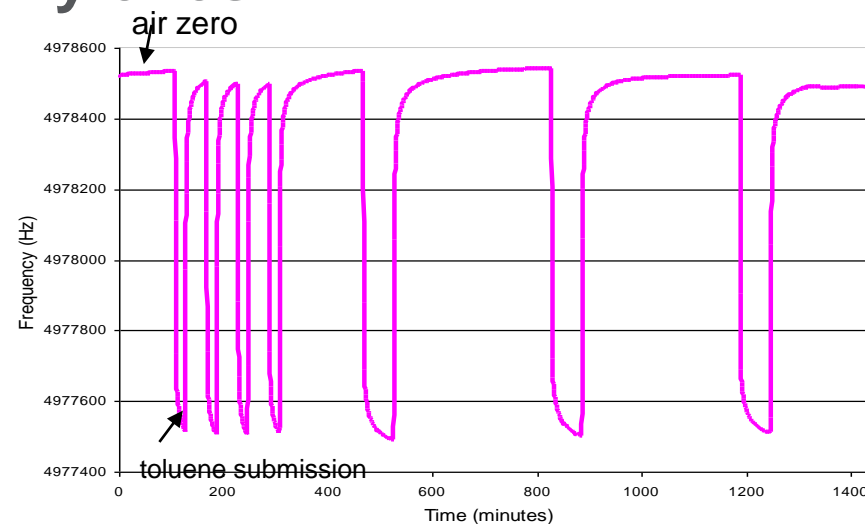
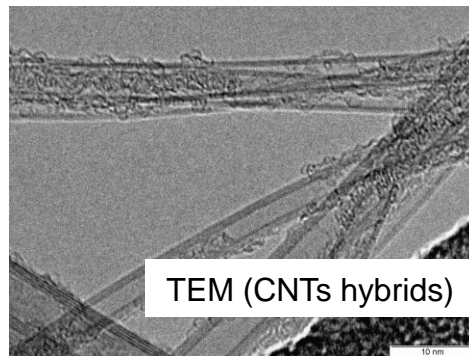
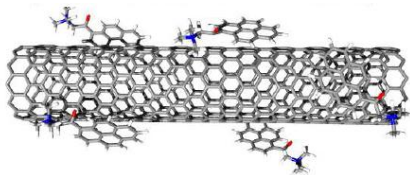
CNTs debundling (surfactant)



Surfactant: SDS, NaDDBS, etc.



Functionalized nanocarbons for sensor applications: detection of Toluene and Xylenes



CONCLUSIONS

Main conclusions and opened questions on CNT-materials and hybrids
CNT-materials for sensor applications

- Dispersion techniques can be used to realise low cost-sensor devices
- Chemical functionalisation allow to target the gas species
- Combining different transduction mode is a promising way to understand sensing mechanisms.
- Problem causing the baseline updrift observed in CNTs-based material is still unidentified
- Effect of ozone on CNTs is still under investigation (damage caused by long time exposure)
- Selective detection of the BTX gases is still an opened question