



**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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Degree (Pursuing PhD)

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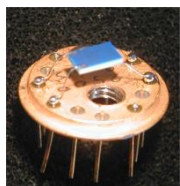
Affiliation / Country : Institut Pascal,

Blaise Pascal University, France.

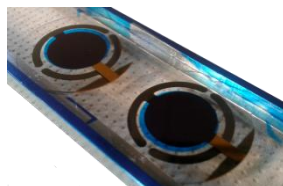
• Expertise related to the Action

- Synthesis of molecular materials having their applications in organic electronics.
- Deposition of thin film of organic / hybrid materials.
 - a) PVD (Physical Vapor deposition) b) Drop casting
 - c) Langmuir Blodgett deposition
- Development of gas sensors microsystems for the sensitive and selective detection of pollutant gases in atmosphere.
- Electrical characterization of thin film (organic/Hybrid)
- Optical characterization of thin film (organic/hybrid)
 - a) IR spectroscopy
 - b) UV-Visible spectroscopy
 - c) Photoluminescence Spectroscopy
 - d) Time resolved photoluminescence spectroscopy
- Theoretical and experimental study of structure and morphology of nanoscale materials.

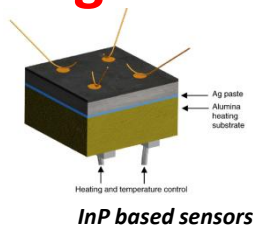
- Research activities at Gas sensor team of Institut Pascal
- Gas sensors using organic, inorganic and hybrid materials.



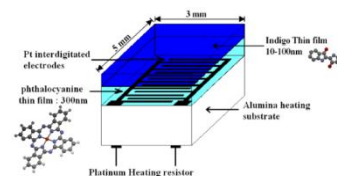
Conductometry



QCM

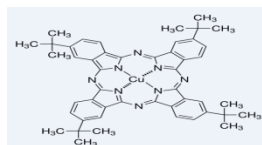


InP based sensors

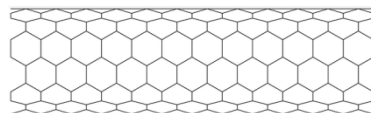


Organic heterojunction based sesors

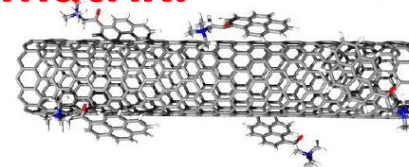
- Surface Functionalization of carbonaceous matrix.



Tetra-terbutyl-CuPc

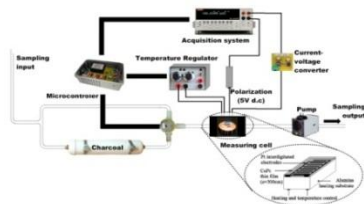


nanotube

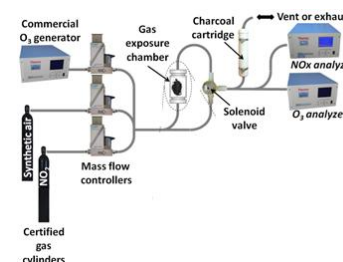


Functionalized nanotube

- Chemical filters and working methodology for selective detections



Methodology for selective detection of ozone



Selective detection of NO₂ using chemical filter

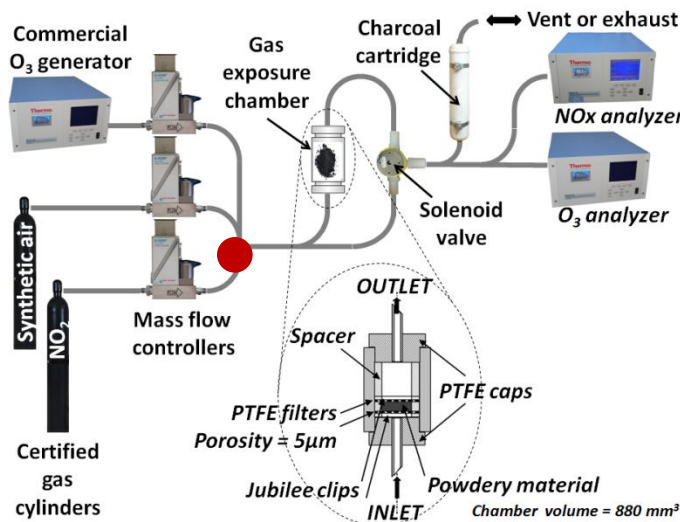
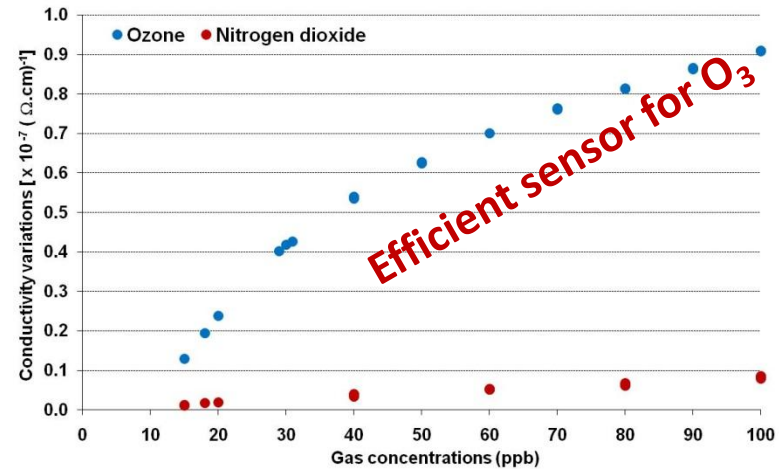
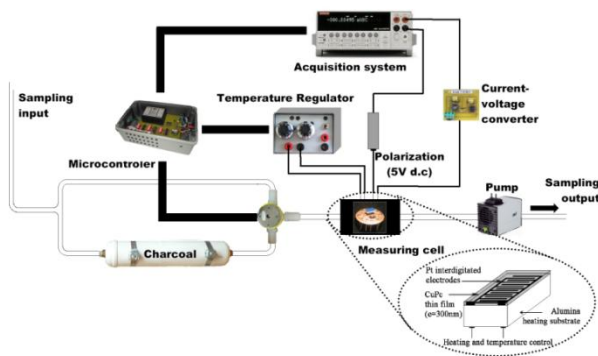
- CAPBTX ANR project for the development of BTEX gas sensors.

- My current research activities

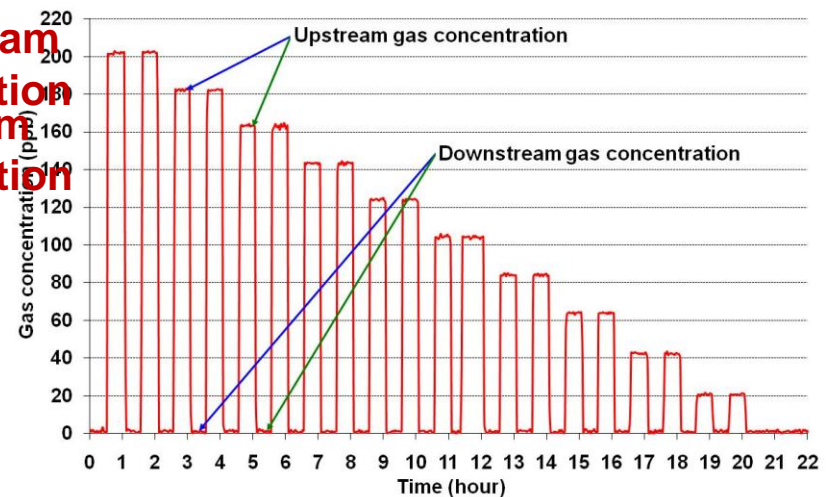
- Development of gas sensor test bench for the detection of BTEX gases.
- Study of sensors response towards BTEX gases using QCM and resistive transduction mode.
- Thin film deposition of organic/hybrid materials.
 - a) Thermal evaporation b) Drop Casting
- Synthesis of molecular materials for their application in gas sensing, e.g. LuPc₂ synthesis by solid phase reaction.
- Study of Gas-material interaction at the sensor surface.
- Theoretical study of charge transport in organic/hybrid thin film.

Achievements of my research team in environmental monitoring

Development of filters and sensing methodology for the selective detection of Ozone and NO₂.



Downstream
concentration
Upstream
concentration



Future Activities

- Development of a Gas sensors Microsystems for the selective and sensitive detection of BTEX gases.
 - a) optimization of test bench for BTEX gases.
 - b) To find an appropriate macrocycles materials (phthalocyanine or porphyrine) or a hybrid materials sensitive towards BTEX gases.
- To develop a simplified synthesis route for molecular materials and test these materials as sensitive layers in BTEX gas sensors.
- Understanding of Gas/sensor surface interaction and proposition of a model for the interaction of BTEX gases with the sensor surface.

CONCLUSIONS

- Carbonaceous nanomaterials can be used as a chemical filter for the selective detection of oxidizing gases like NO₂.
- A proper sensing methodology can be developed to enhance the sensitivity and selectivity of sensors.
- Macrocycles based on Phthalocyanine can be an promising materials constituting the sensitive layer of sensor for BTEX detection.
- Inexpensive, real time monitoring and fast detection of BTEX gases are still an open question.
- Interaction of BTEX gases with sensitive layer of sensors has not been understood clearly and needs to be elucidated in detail.

THANK YOU