COST

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

COST Action TD1105

WGs and MC Meeting at Cambridge, 18-20 December 2013

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

Year 2: 1 July 2013 - 30 June 2014 (*Ongoing Action*)

## Round-Table

Marcel BOUVET

Sub-WG 1.3 leader, MC member

University of Burgundy - Dijon / France

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

50th Anniversary of Metal Oxides Gas Sensors: Which future for Emerging Sensor Technologies ?

- **50th Anniversary of Metal Oxides Gas Sensors:**

  - 1st patent by Tagushi (Japan)

  - 1st company: Figaro (1960s)

  - based on SnO_{2-x} semiconductor: non selective, operating between 200 and 500 °C

  - Market: millions per year

- **Developed with many MO_x materials and preparation methods; in 3D, 2D and 1D; doped with metals or decorated with NPs**
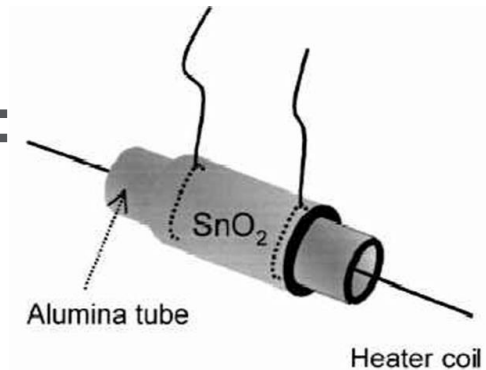
Why we need other materials?

- Main drawbacks of MO_x materials:

    - lack of selectivity

    - drift of structure and morphology

    - lack of reproducibility of the obtained materials

- Figaro's opinion given in the framework of a market study:
    - they have interests for sensors (NH_3) operating at RT
    - but their first question was: What about humidity?

- Molecular or hybrid materials can figure out these questions.

- **New materials: molecular materials, organic/inorganic hybrids, polymers, or any combination … to tune properties:**
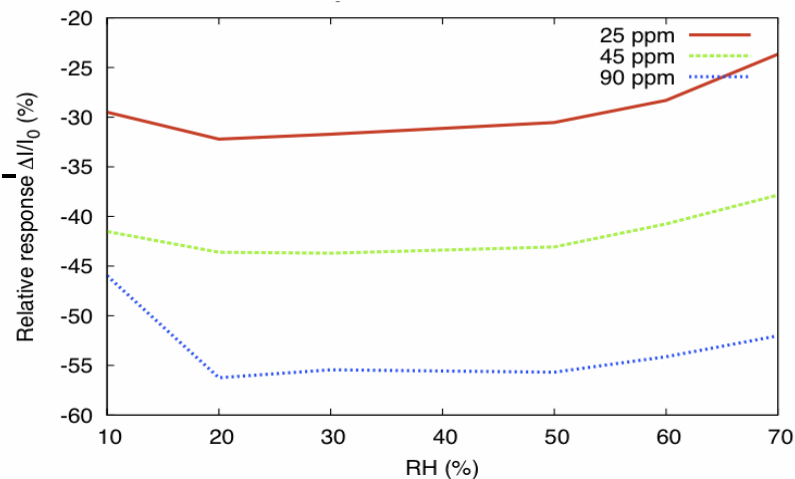
morphology, roughness and specific surface, hydrophilicity or hydrophobicity,

processability, electrical properties, operating temperature **and selectivity**
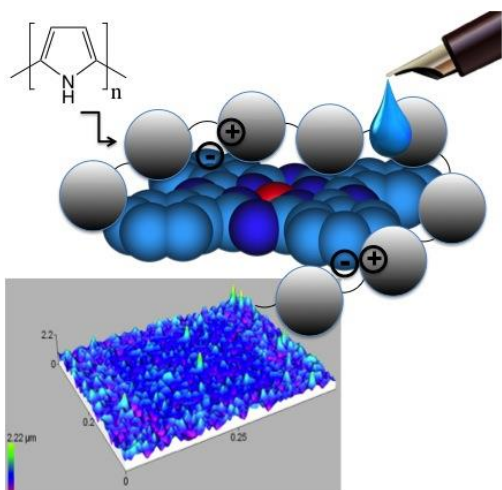
J. Mater. Chem. 2012

Relative response
to NH_3
of a molecular material-
based resistor

Sensors and Actuators B,
159, 163–170, 2011

- **New technologies are needed to stabilize the structure and morphology of sensing materials for a higher stability of the response of sensors**

- **To design new transducers (very rare)**

MSDI

- **Low cost/high scale production technologies:**

    - solution processing (ink-jet printing …)

    - flexible sensors (for integration on any substrate, including clothes)

    - electrodeposition that allows to deposit different materials   on different electrodes, on the same substrate

- **To obtain a confident opinion on the performance of a material, in terms of stability and reproducibility of the sensing response, the inter-laboratory reproducibility of materials should be studied ?**

  Few materials should be chosen with a particular processing, e.g. one metal oxide prepared as nanoparticles, one CNT-based material and one molecular material deposited as thin films

Inter-laboratory reproducibility of materials?