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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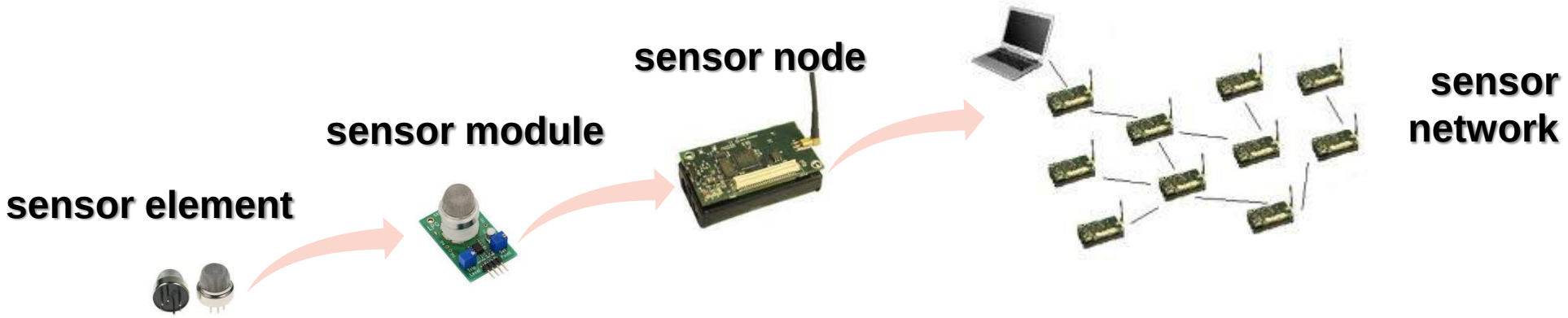
Scientific context and objectives in the Action

- **Sensors and sensor systems for Air Quality Control**
- **WG2: from nanomaterials to sensor networks** (Sensors, devices and sensor systems for AQC)
- **WG2 objectives:**
- Protocols for fabrication of gas sensors; specifically
  - integration of nanostructures and -materials in AQC gas sensors;
  - design and implementation of new transducers for AQC sensors;
  - device characterization for AQC gas sensors;
- Report for integration of portable gas sensor-systems for AQC;
- Report on integrated intelligence of AQC systems & distr. computing;
- Protocols for development of wireless sensors network for AQC;
- Report on IP Rights of gas nanosensors for AQC.

Scope: from nanomaterials to sensor networks



- Investigation of the integration effect of novel sensor element level materials and techniques on AQC sensor systems
  - Closely linked to WG1 activities
- Study of sensor elements active control techniques on all levels:
  - Sensor module ➔ enhanced electronics (i.e. for self-monitoring)
  - Sensor node ➔ improved selectivity and stability via information correlation
  - Sensor network ➔ enhanced reliability, auto-configuration/calibration

Suggested **Priorities** for future research (1/3)

Research directions as PRIORITIES for APPLICATIONS:

- **Outdoor air quality monitoring** (imission control)
  - Better information for citizens and awareness of pollution
- **Indoor air quality monitoring** (imission control)
  - Controlled ventilation due to monitoring of hazardous VOC
  - Reduced health hazards plus improved energy efficiency
- **Outdoor monitoring of pollution sources** (emission control)
  - Identification of sources and minimization of emissions
- **Closed loop process control** (industrial, transport, home use)
  - Minimization of emissions at source, active countermeasures

Suggested **Priorities** for future research (2/3)

Research directions as PRIORITIES for SENSOR TECHNOLOGY:

- Versatile µ-transducers for integration of various nanomaterials
  - Allow application specific adaptation and **low cost**
  - **Low power**! (down to µW for single nanowire)
- **Dynamic operation of sensors** to gain more than one signal from a single sensor for higher selectivity and stability as well as possible self-monitoring **at the sensor module level**
  - Well known, but not yet standard: temperature cycling, EIS
  - New methods: RF, optical excitation (gas sensitive solar cell!), pulsed polarization, mass and dissipation in QCM
  - Modelling of interaction of sensing layer and gas/dust/aerosol

Suggested **Priorities** for future research (3/3)

Research directions as PRIORITIES for SENSOR TECHNOLOGY:

- **Selective filters** integrated in sensors or sensor modules
- Dosimeter approach: integrated sensor response
- **Nanoparticle detection** for dust and aerosols!!
- Intelligent sensor modules for NO_x, ozone, NH_3, H_2S, SO_2, VOC
  - Electronics combined with sensor elements
- Intelligent sensor nodes and (heterogeneous) networks
  - Data pre-processing and processing (in node and/or in network: parallel and distributed computing)
  - Energy efficient communication

Goal: Demonstrate the potential of (micro) sensor systems in the context of environmental sensing (complementarity, added resolution – spatial and temporal), **including an assessment of performance**