Overview of the COST Action TD1105 EuNetAir

TCM 2012 - Hersonissos, Crete, 21 October 2012

Call Full Proposal reference oc-2011-1-9706 for a COST new Action TD1105

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

Proposer/Chair: Dr. Michele Penza

ENEA

Italian National Agency for New Technologies, Energy and Sustainable Economic Development

Technical Unit Brindisi Technologies for Materials

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COST ACTION TD1105
EuNetAir

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

OUTLINE

- *State-of-the-Art on Air Quality Control Technologies*
- *What is Program COST ?*
- *Objectives of a COST Action*
- *COST Action TD1105 EuNetAir:*

Objectives, WorkPlan, Structure and Coordination, Gender Balace, Early Stage Researchers, Short Term Scientific Missions, Timetable, Dissemination Plan

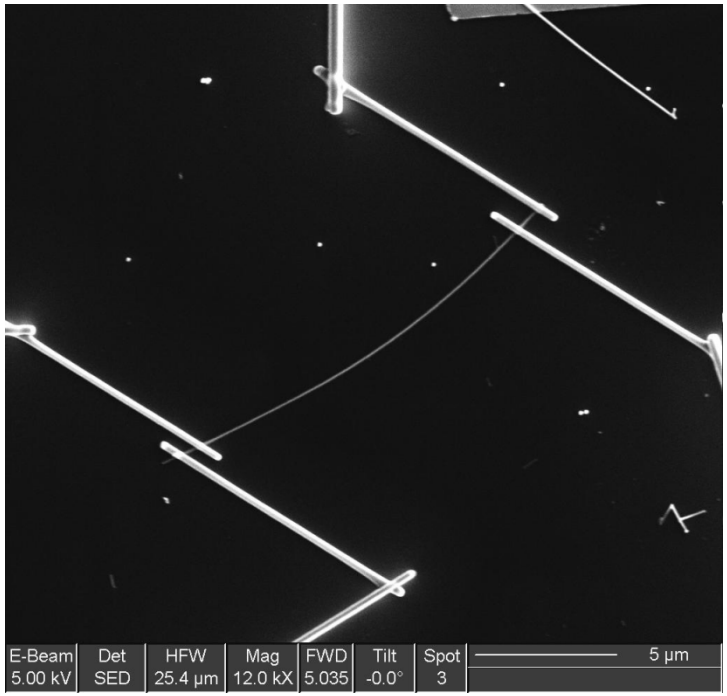
- *Conclusions*

NANOSENSORS

J. D. Prades, et al., J. R. Morante, Sensors and Actuators B 144 (2010) 1-5

Courtesy from University of Barcelona and IREC.

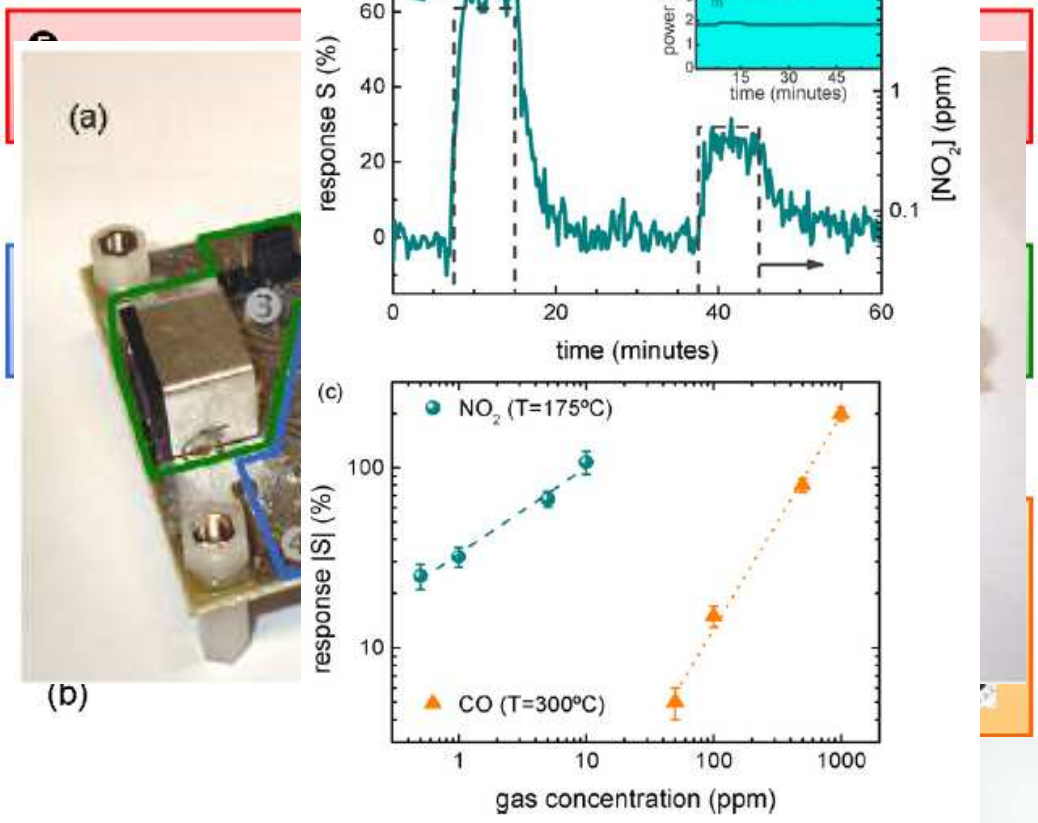
SnO_2 Nanowires



Self-heating of Nanowire

Temperature gradient of 20°C generates 5 mW to operate nanosensor, including electronics.

Micro-Nano s nit

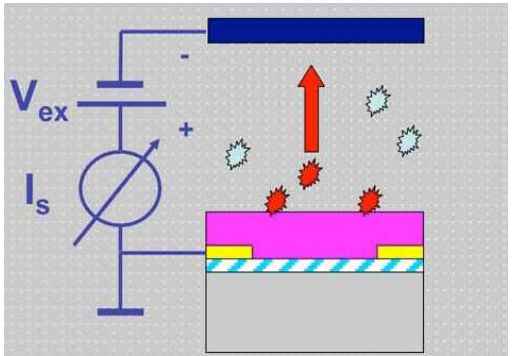


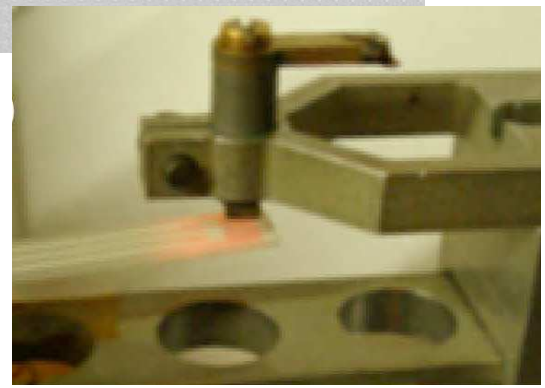
ACTION TD1105: *STATE OF ART ON AQC* - NANOMATERIALS

SURFACE IONIZATION (SI) device: Vertical Layout

A. Ponzoni, et al., IMCS-2012, Nuremberg, 20-23 May 2012

Courtesy from University of Brescia

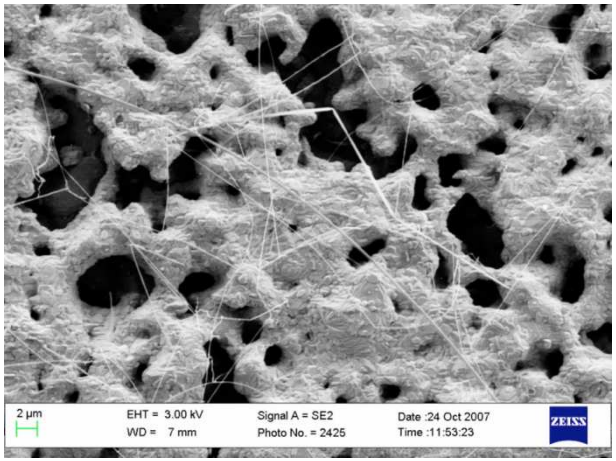


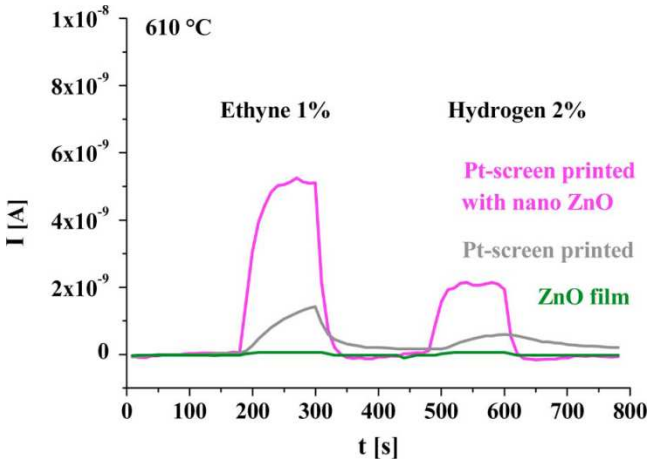


Typical experimental parameters

- Bias Voltage: 1000V
- Electrode-oxide spacing: d = 1mm → E = 10^6 V/m
- Sensor Temperature: 500-700 °C

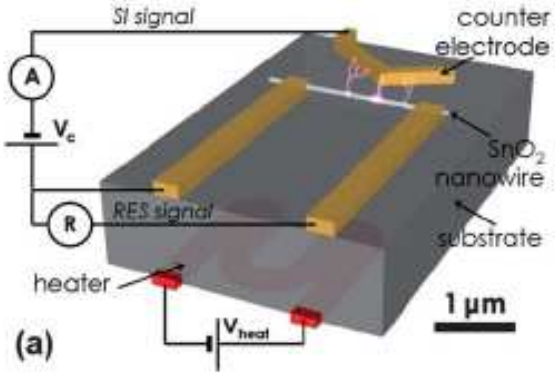
ZnO nanowires on Pt electrode to Ethyne and Hydrogen





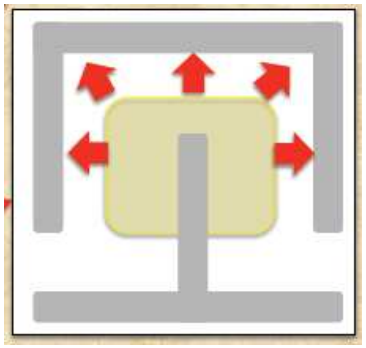
CuO nanorods to Acetone

SI Single Nanowire device: Planar Layout



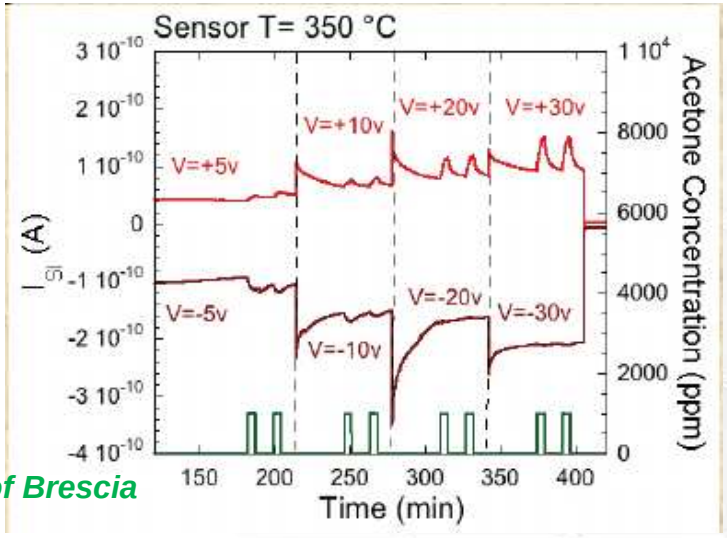
F. Hernandez-Ramirez, et al., Nanoscale 3 (2011), 630

Courtesy from IREC

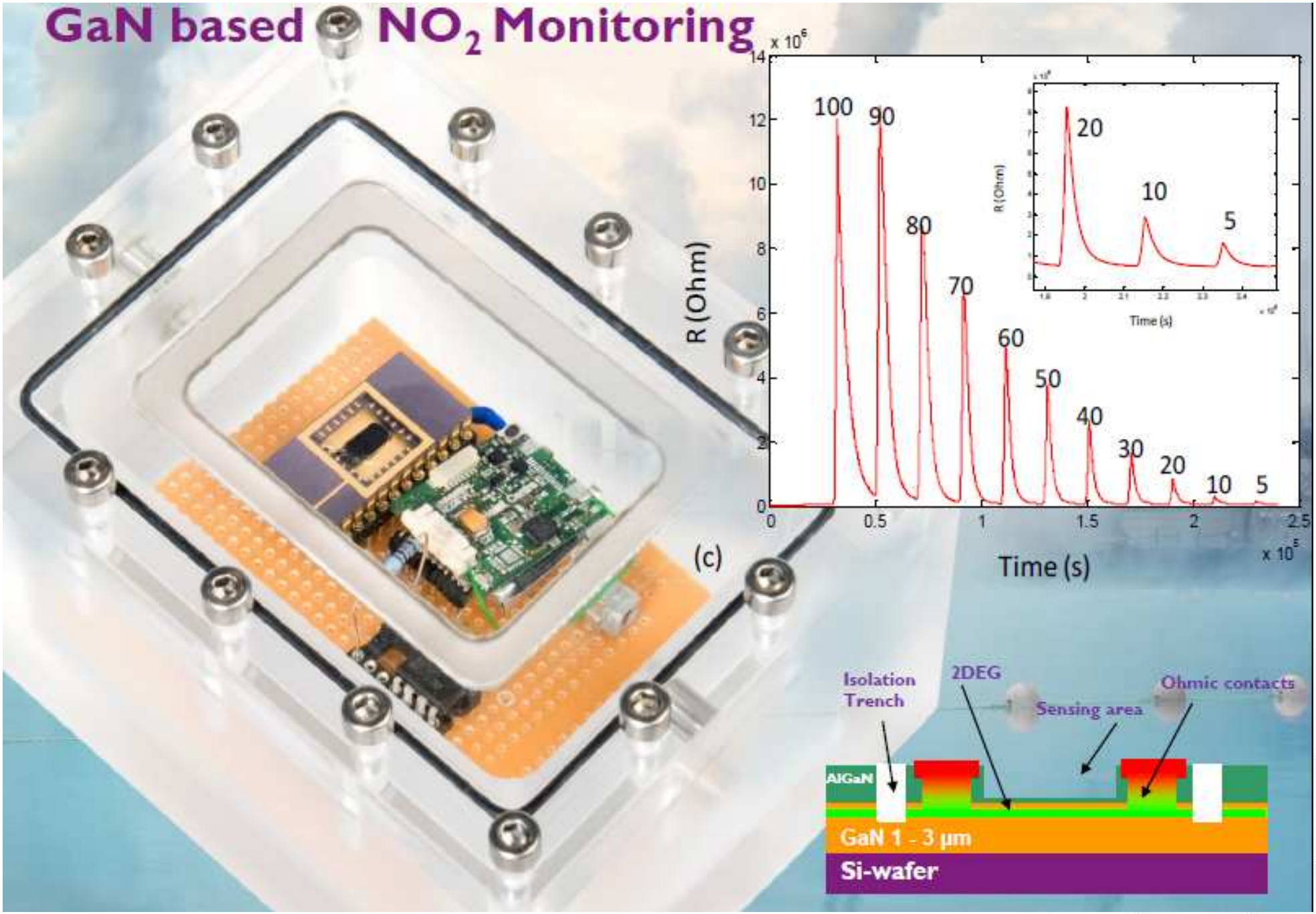


A. Ponzoni, et al.,

Courtesy from University of Brescia



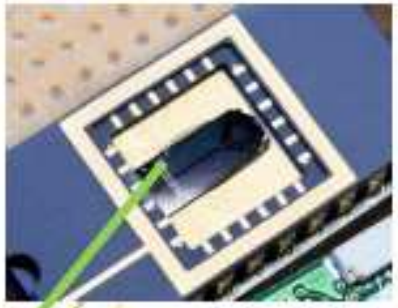
ACTION TD1105: *STATE OF ART ON AQC* - GAS SENSORS

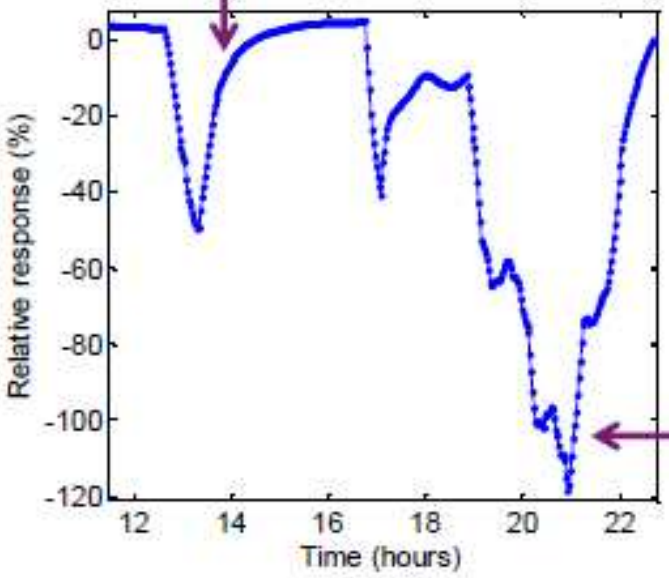


Courtesy by Sywert H. Brongersma from IMEC Holst-Centre

Low-ppb environmental monitoring

Parking garage



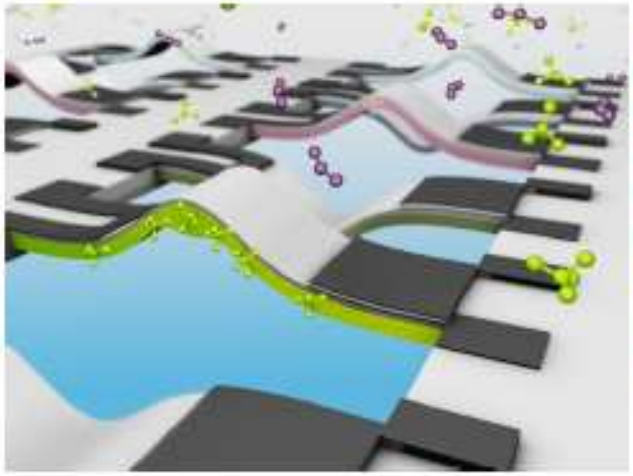


Clean air in nature

- ✓ Battery operated
- ✓ On-chip data storage
- ✓ Humidity and temperature
- ✓ Simple resistive readout
- ✓ Reversible
- ✓ Sub-ppb detection limit
- ✓ Very low cross-sensitive to e.g. SO_2, CO_2, NH_3

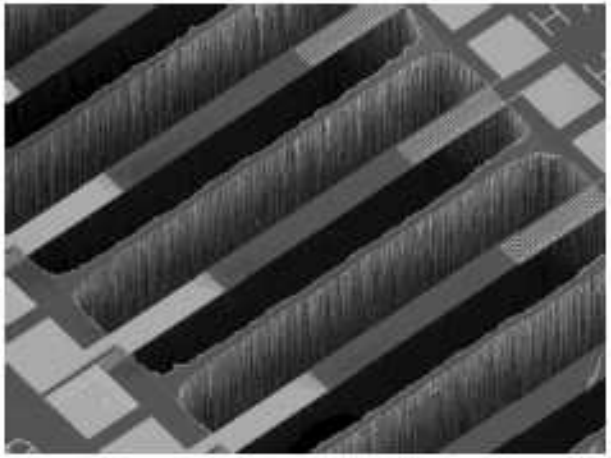
Courtesy by Sywert H. Brongersma from IMEC Holst-Centre

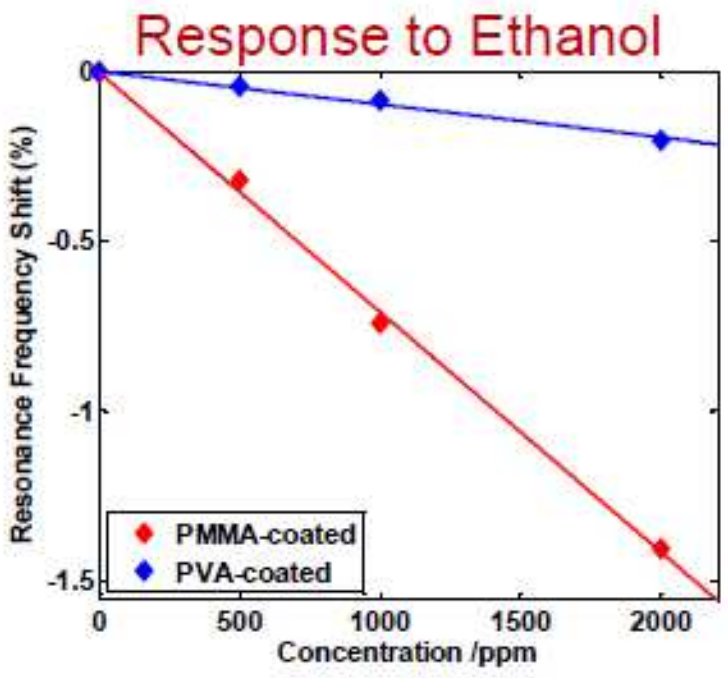
Towards a miniaturized MEMS e-nose

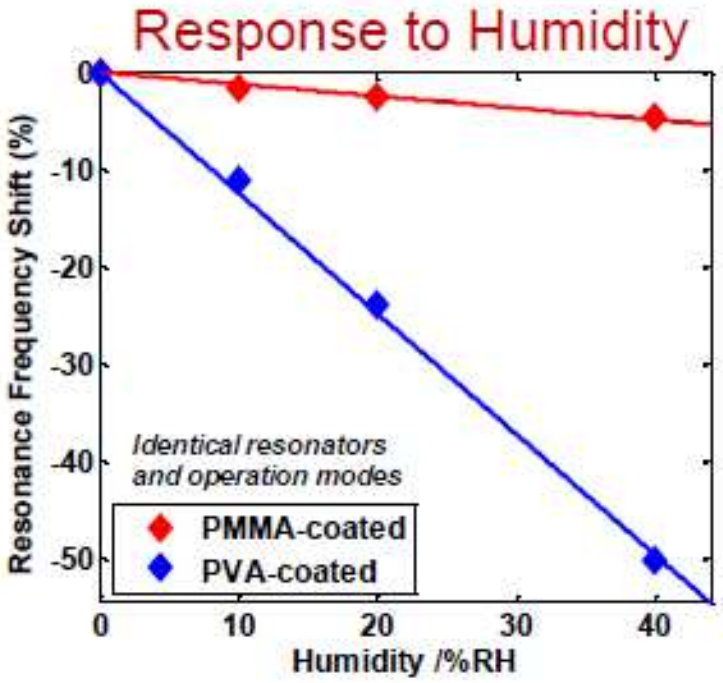


CONCEPT

REALITY





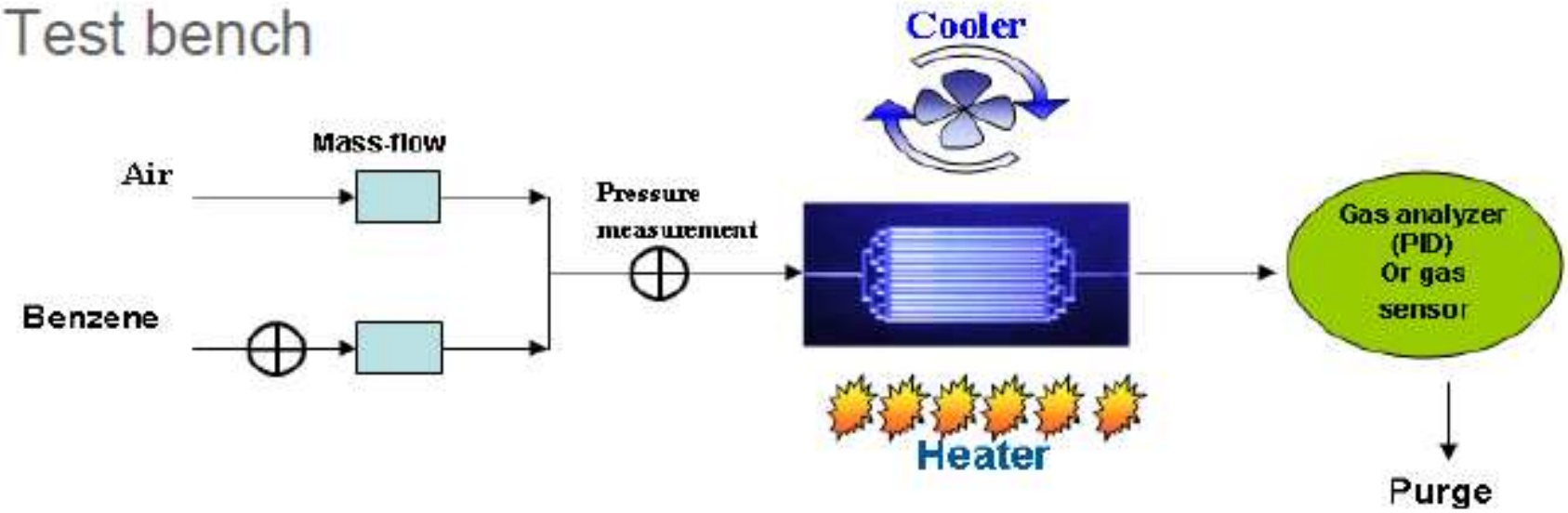


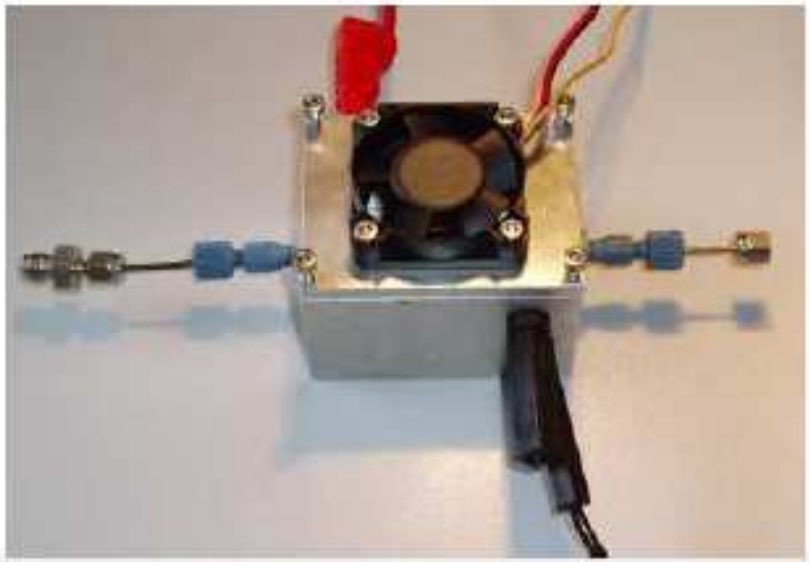
Courtesy by Sywert H. Brongersma from IMEC Holst-Centre

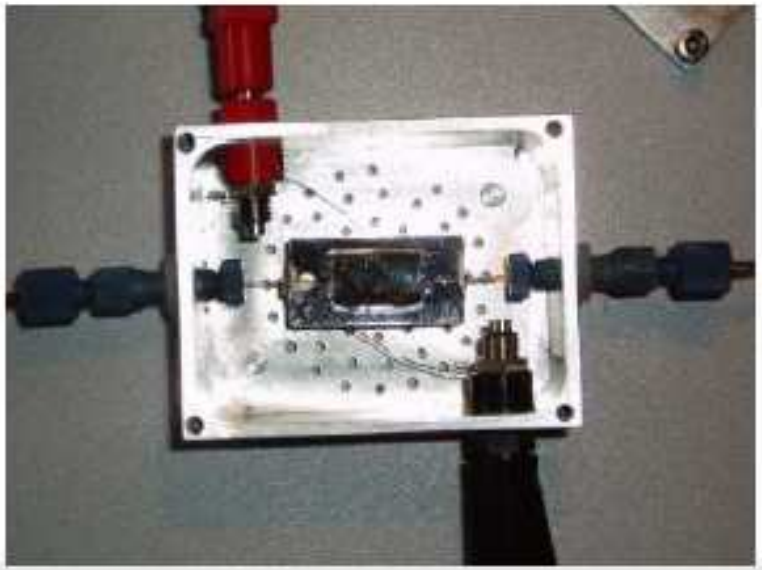
Micro gas preconcentrator

Ecole Nationale Supérieure des Mines SAINT-ETIENNE

- Test bench



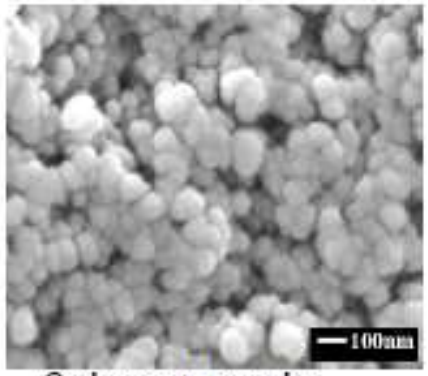




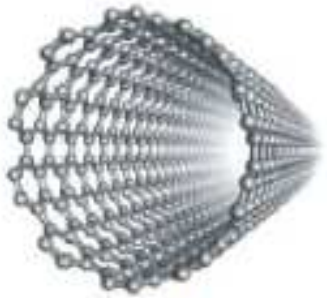
Courtesy by Danick Briand from IMT - samlab, EnviroMEMS, EPFL, Switzerland

Micro gas preconcentrator

Ecole Nationale Supérieure des Mines SAINT-ETIENNE



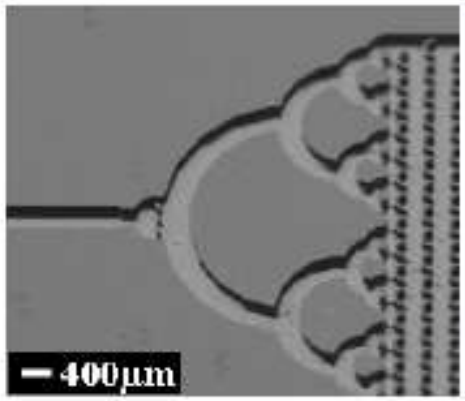
Carbon nanopowder

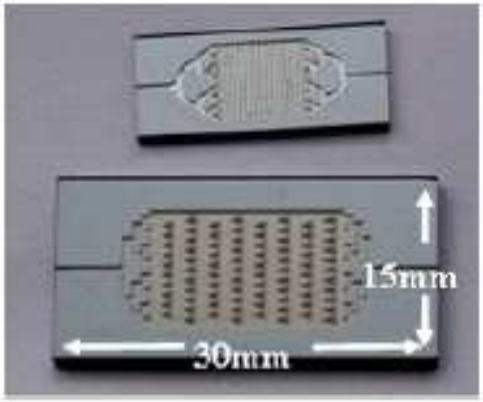

SWCNT

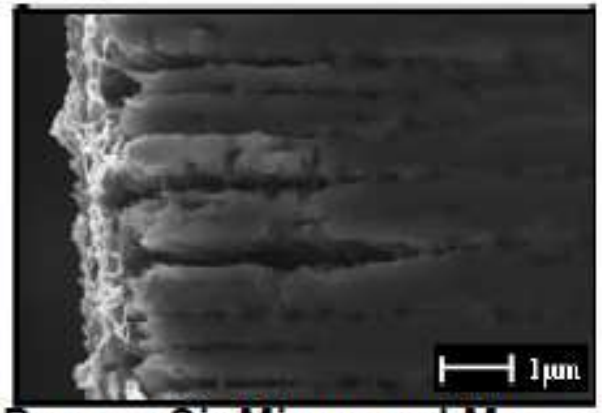

MWCNT


Polymer Tenax TA.

- Absorbent choice based on specific surface and affinity to gases
- Deposition method chosen according to particles size
- Test under exposure to benzene, xylene, nitrobenzene







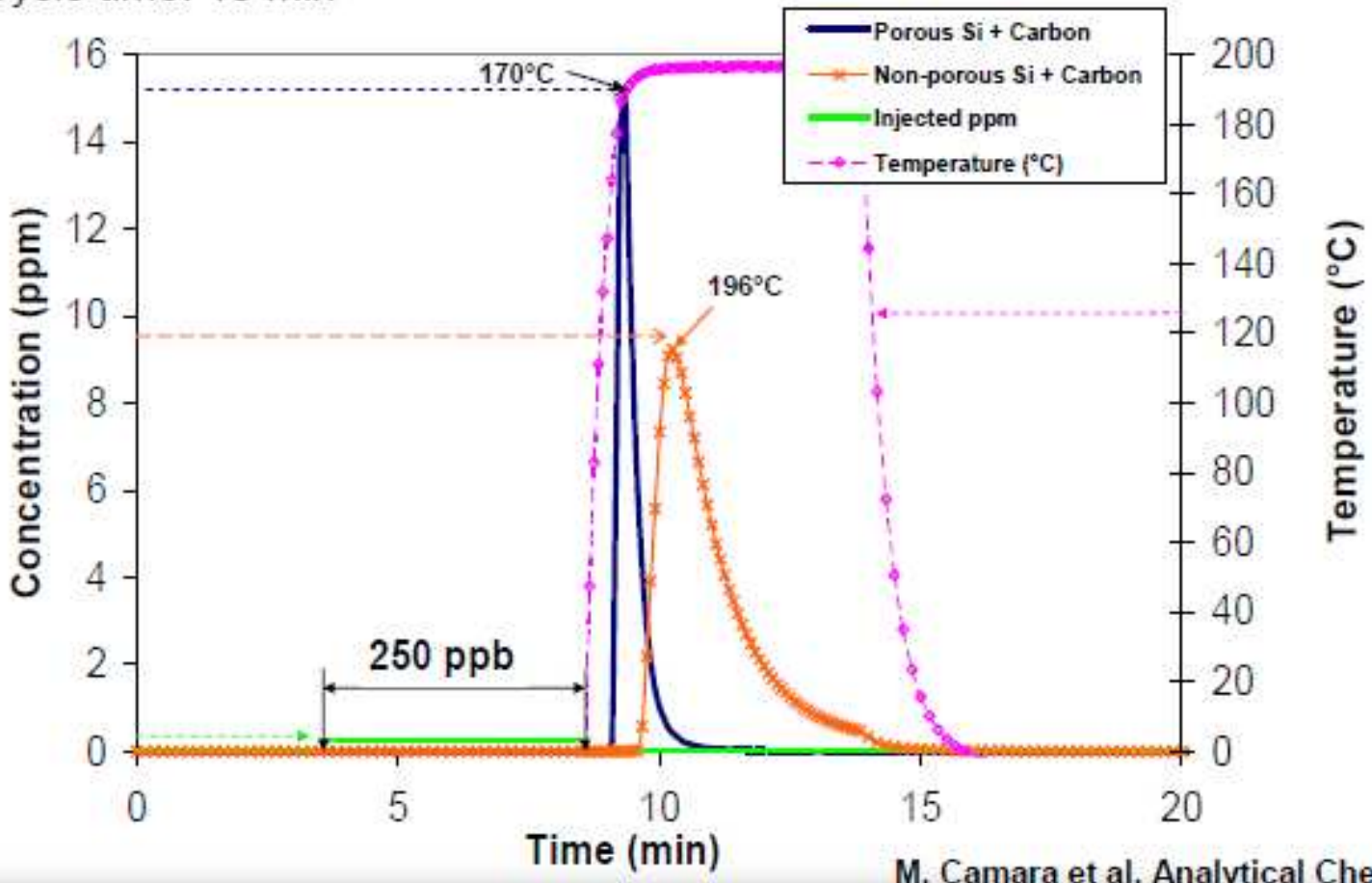
Porous Si: Micro and Macro

Courtesy by Danick Briand from IMT - samlab, EnviroMEMS, EPFL, Switzerland

Micro gas preconcentrator

Ecole Nationale Supérieure des Mines SAINT-ETIENNE

- Standard vs. Porous silicon
  - Flow absorption: 10 L/h, desorption: 2 L/h
  - Temperature ramp: 160°C/min
  - Cycle time: 10 min

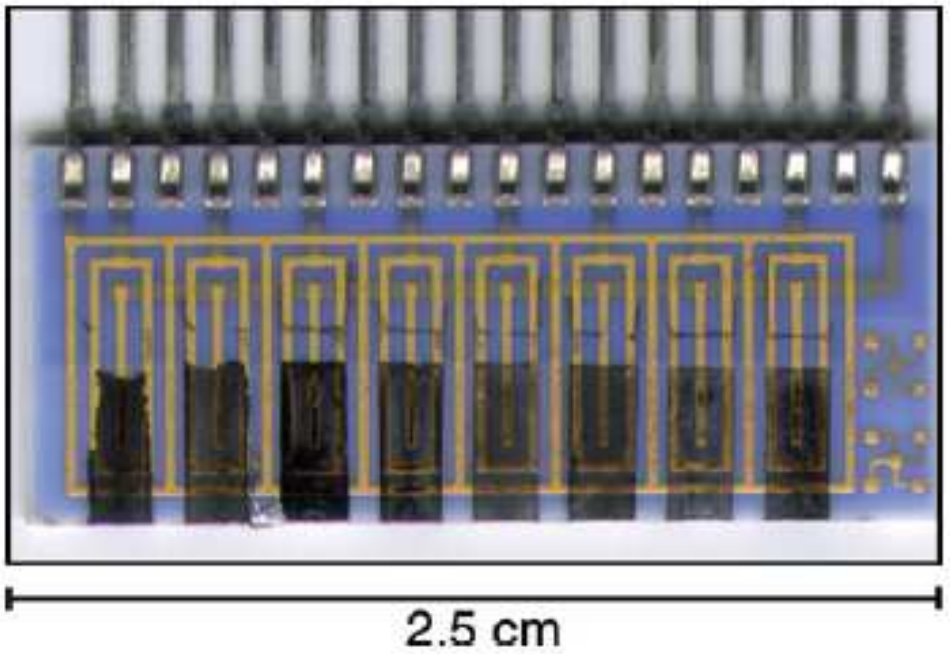


M. Camara et al. Analytical Chemical Acta, 2010

Courtesy by Danick Briand from IMT - samlab, EnviroMEMS, EPFL, Switzerland

Monitoring Space Shuttle Cabin Air Quality using the Jet Propulsion Laboratory NASA Electronic Nose

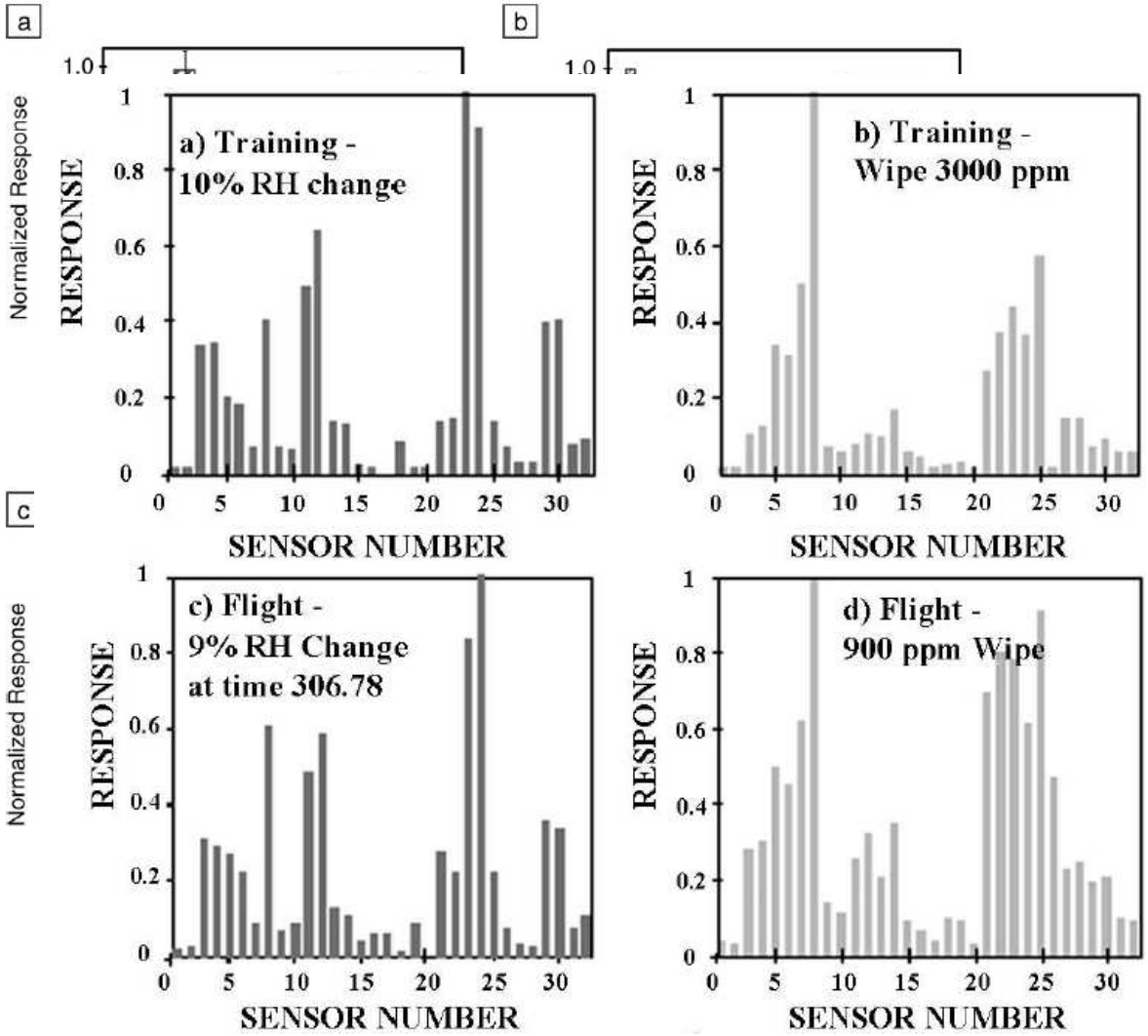
The sensor ceramic substrate is 25 mm x 10 mm.
Sensing area of each electrode: 2 mm x 1 mm.
Eight Au-Pd electrode sets.
Polymer-carbon black composite films.
JPL NASA E-Nose: 32 sensor array.



M. A. Ryan et al., IEEE Sensors Journal 4 (2004) 337

ACTION TD1105: *STATE OF ART ON AQC* - GAS SENSORS

Monitoring Space Shuttle Cabin Air Quality using the Jet Propulsion Laboratory NASA Electronic Nose

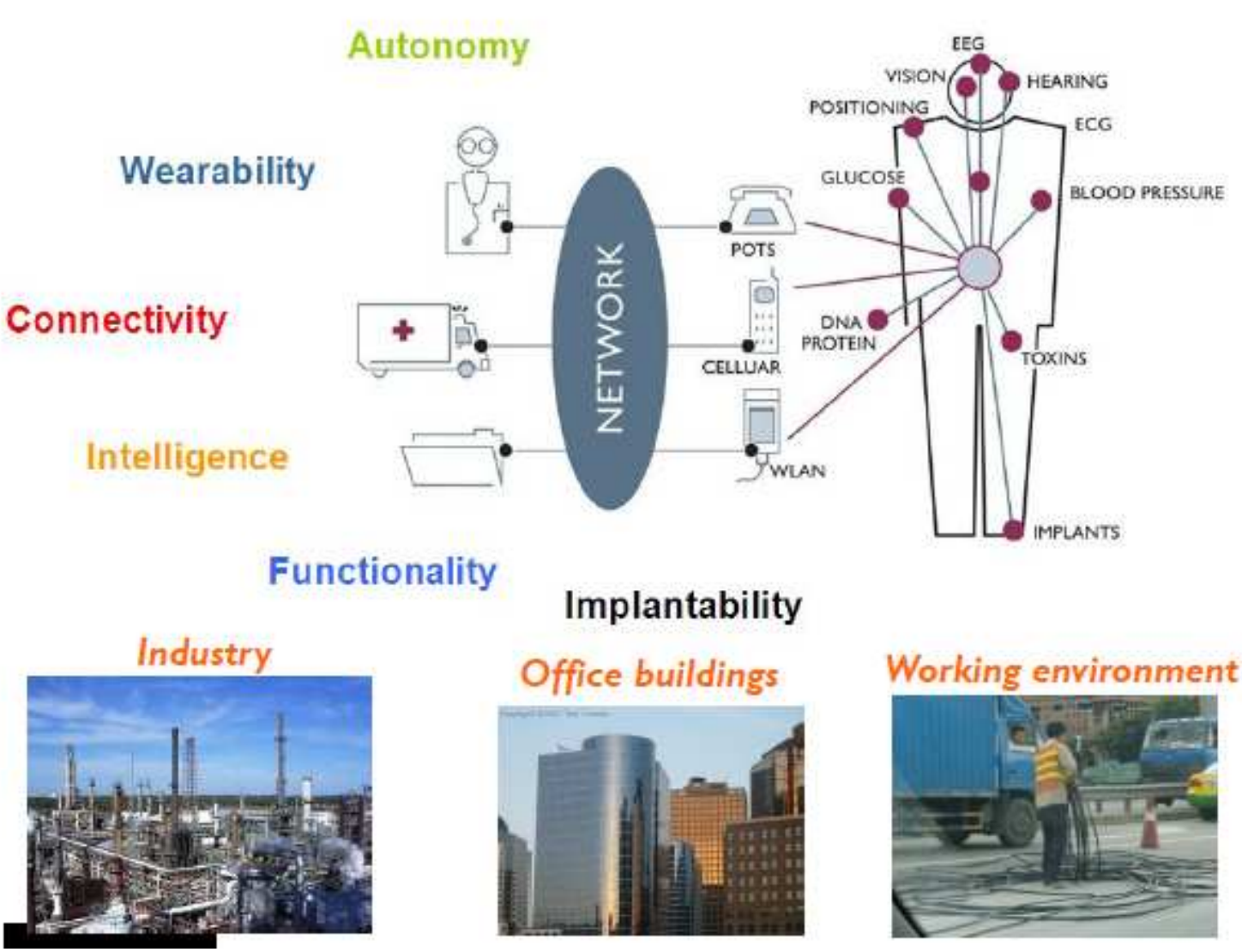


- **The sensor ceramic substrate: 25 mm x 10 mm.**
- **Sensing area of each electrode: 2 mm x 1 mm.**
- **16 or 32 Au-Pd electrode sets.**
- **Polymer-carbon black composite films.**
- **JPL NASA E-Nose: 32 sensor array.**

Wipe is a mixture of alcohols

M. A. Ryan et al., IEEE Sensors Journal 4 (2004) 337

From *Body* Area Network to *Personal* Area Network



Courtesy by Sywert H. Brongersma from IMEC Holst-Centre

The future is coming...!

NASA adapt ***iPhone***
to *smell* chemicals
(Nov 17, 2009)

NTT DoCoMo
A Cell Phone that
spots *Bad Breath*

Nokia Scentsory Concept
e-nose samples the odor of
caller environment and transmit
to recipient electronically

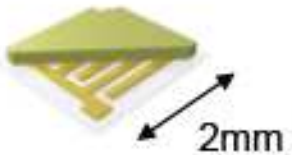
Nokia EcoSensor Concept
Wearable sensor unit to sense
(environment, health..), and a
dedicated mobile phone (not an e-nose yet)

Other concepts:
Health conscious phone
that *smells* food properties

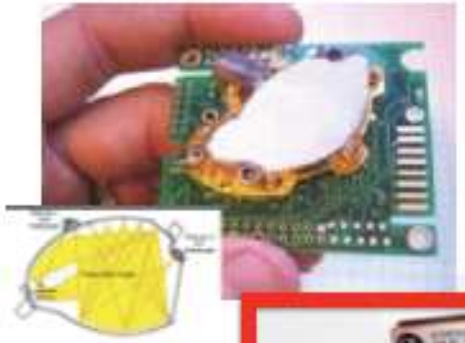
Courtesy by Sywert H. Brongersma from IMEC Holst-Centre

Basis for sensor network system approach:

Low cost miniature gas sensor technologies



- Electrochemical
- Non Dispersive IR
- Photo-ionisation Detection
- Metal Oxide
- SAW
- ……..



>factor of 100 cheaper (and smaller) than traditional methods
- if they can be made sensitive enough

Courtesy by Rod L. Jones from University of Cambridge, and John Saffell from Alphasense Ltd

Mobile sensor network deployment: Cambridge (UK)

- 4 hour deployment (2009)
- > 40 sensors (CO, NO, NO_2, CO_2, VOCs)
- 3 transport modes
  (walkers, cyclists, vehicles)
- Inner city, outer loop (A14/M11)
- Real time GPRS transmission
- >200,000 measurements

UNIVERSITY OF CAMBRIDGE

IMCS 2012, May 20-23, 2012
Nuremberg.

Courtesy by Rod L. Jones from University of Cambridge

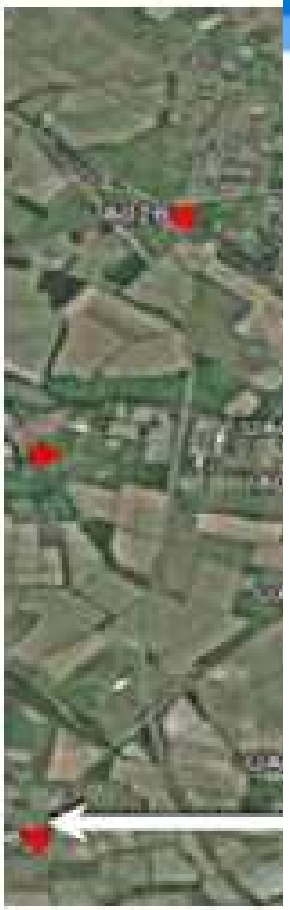
ACTION TD1105: *STATE OF ART ON AQC* - APPLICATIONS

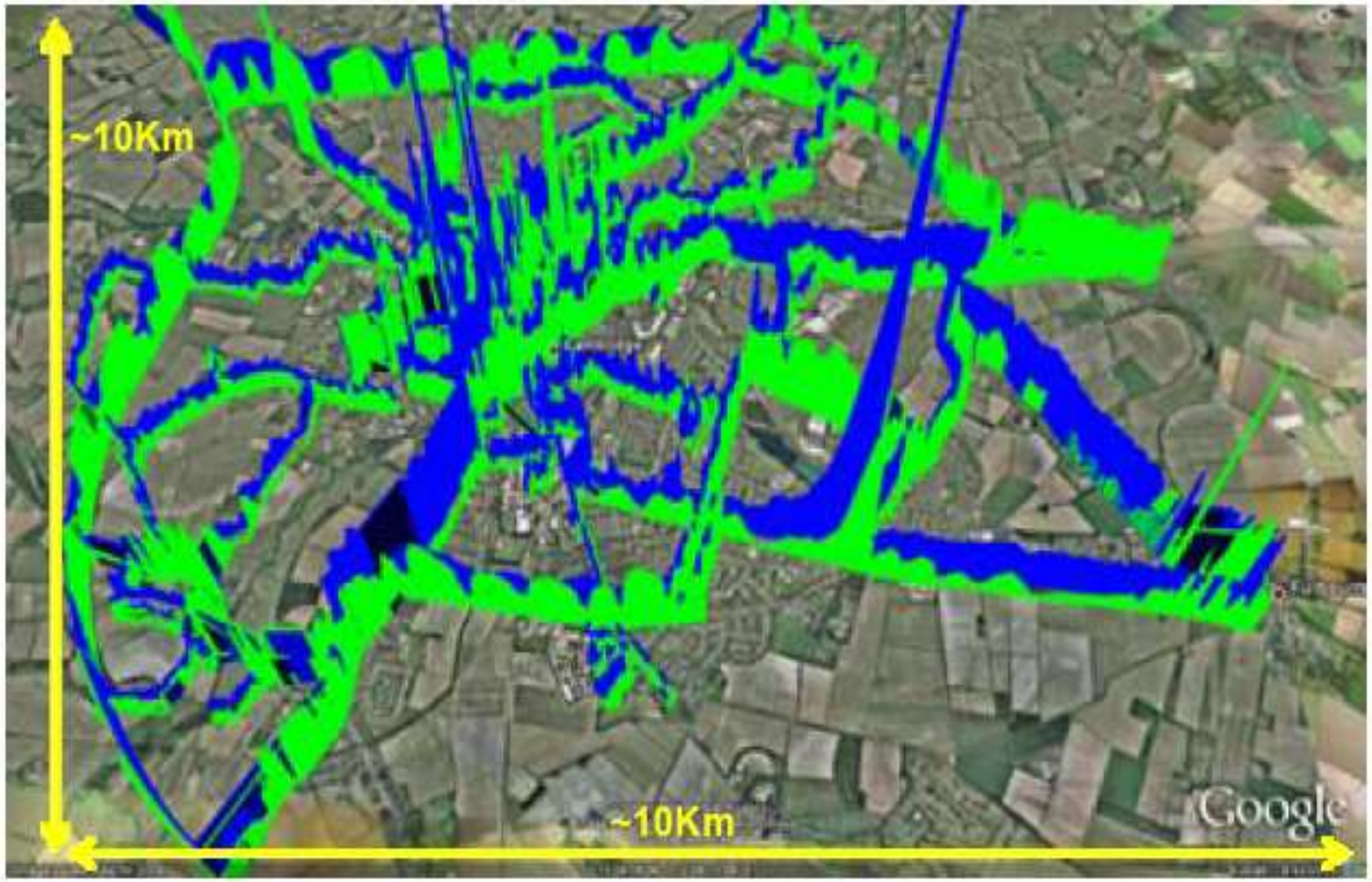
Sensor Network based Urban Pollution Monitoring System at Cambridge (UK)

47 senso

Cambridge deployment August 2009

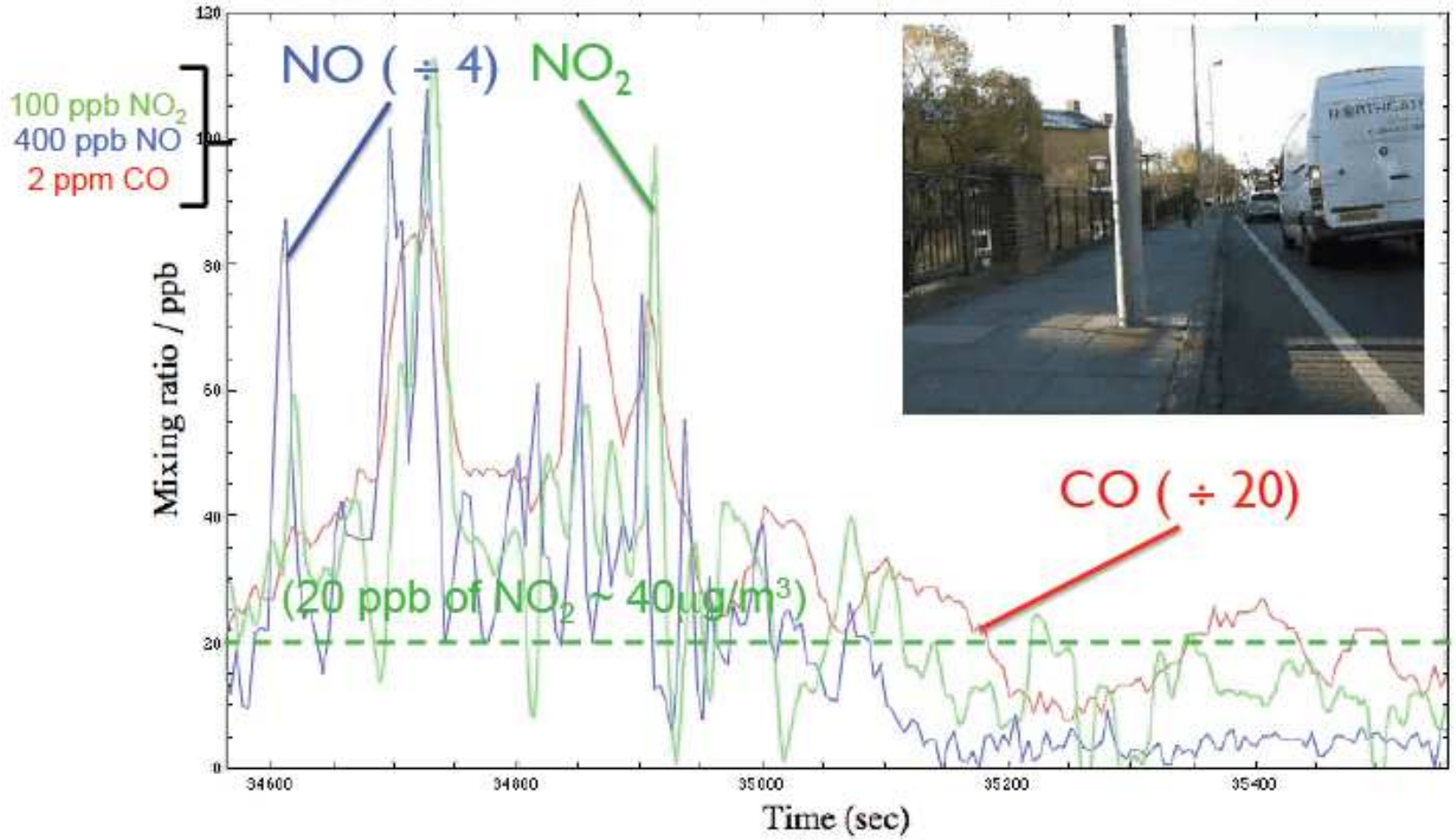
NO (Blue) – NO_2 (Green)





Courtesy by Rod L. Jones from University of Cambridge

Multi-species real time mobile measurements of air quality in complex environments



UNIVERSITY OF CAMBRIDGE

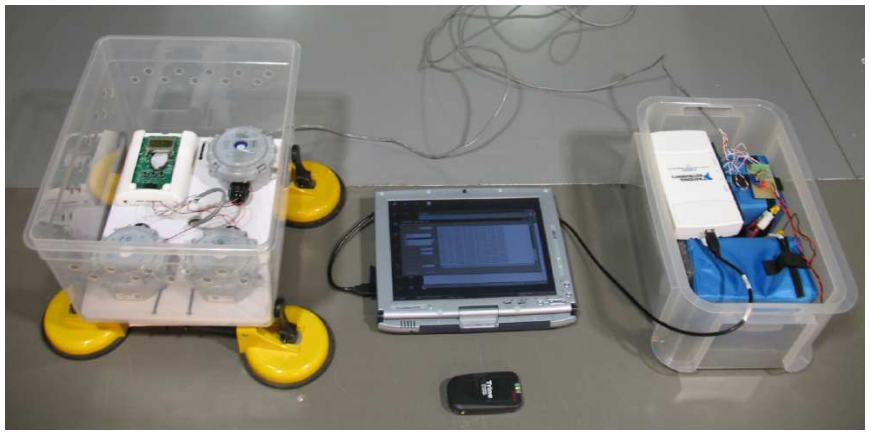
IMCS 2012, May 20-23, 2012
Nuremberg.

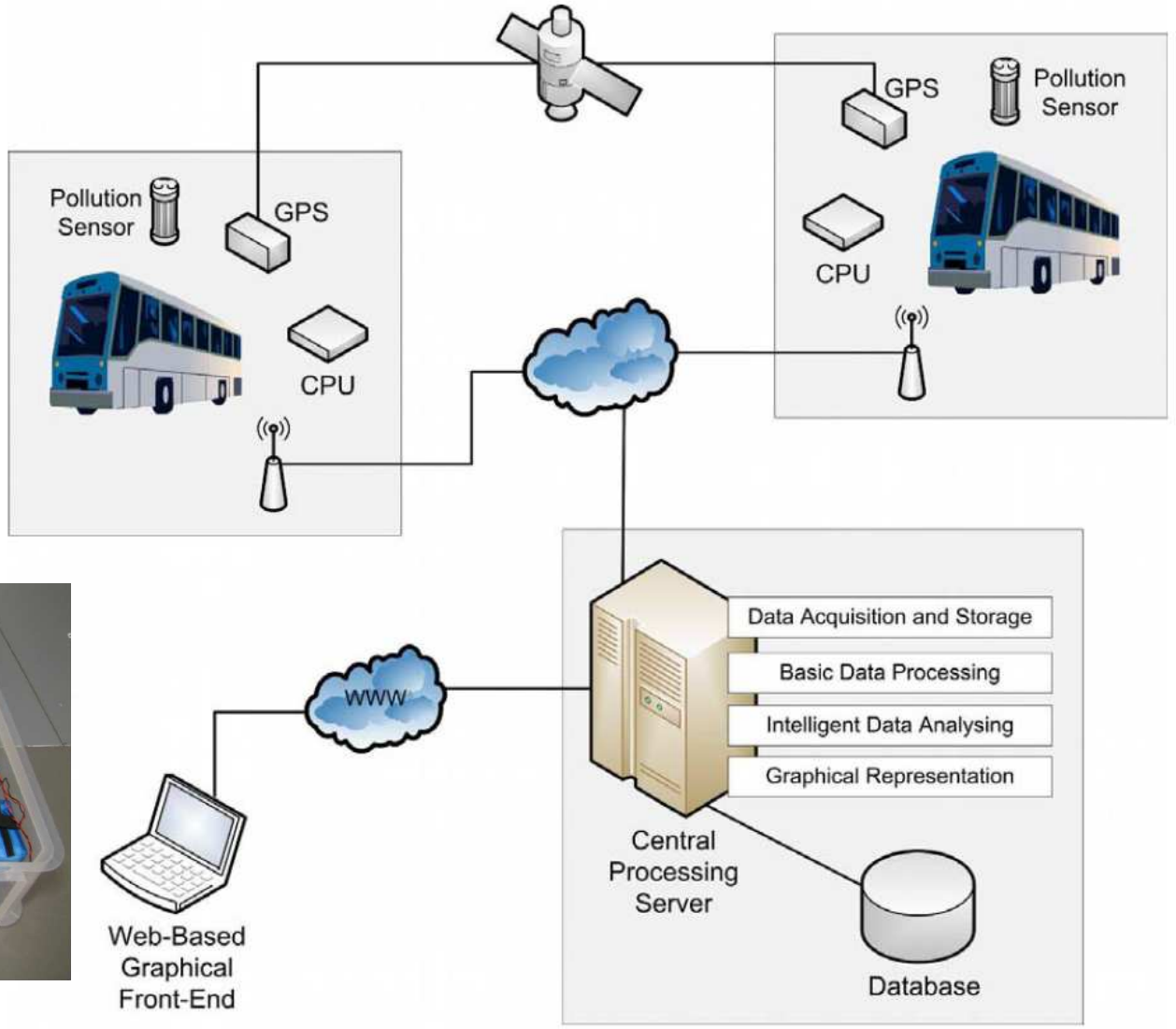
Courtesy by Rod L. Jones from University of Cambridge

Public Transportation based Dynamic Urban Pollution Monitoring System at Vigo and A Coruna (Spain)

Vaisala Sensor
CO_2

Sontay EC Sensors
CO, NO_2, SO_2,
Temperature, RH

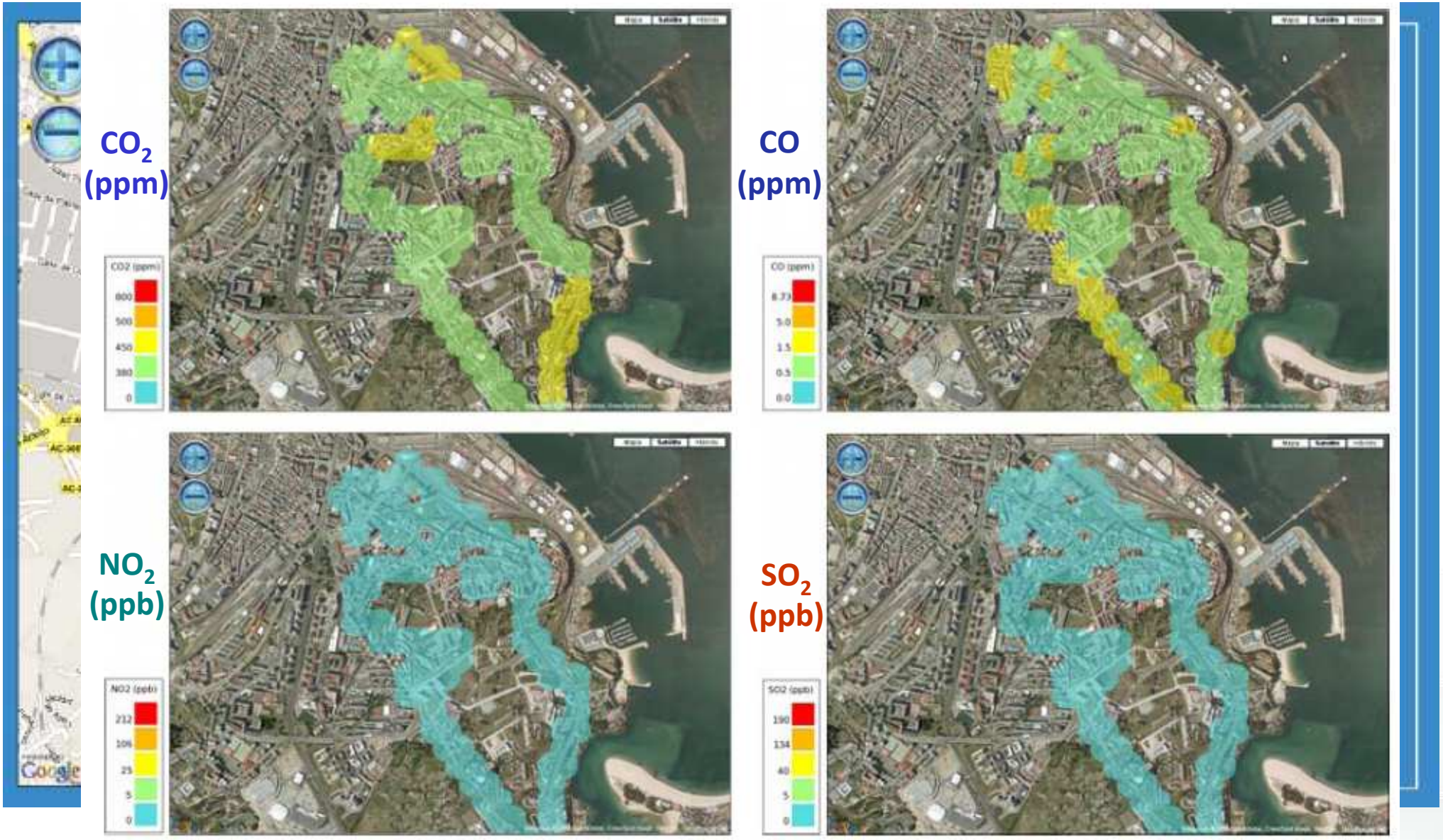




F. Lopez-Pena et al., Sensors and Transducers Journal, 8 (2008) 13-25

ACTION TD1105: *STATE OF ART ON AQC* - APPLICATIONS

Public Transportation based Dynamic Urban Pollution Monitoring System at Vigo and A Coruna (Spain)



F. Lopez-Pena et al., Sensors and Transducers Journal, 8 (2008) 13-25

NanoTera OpenSense

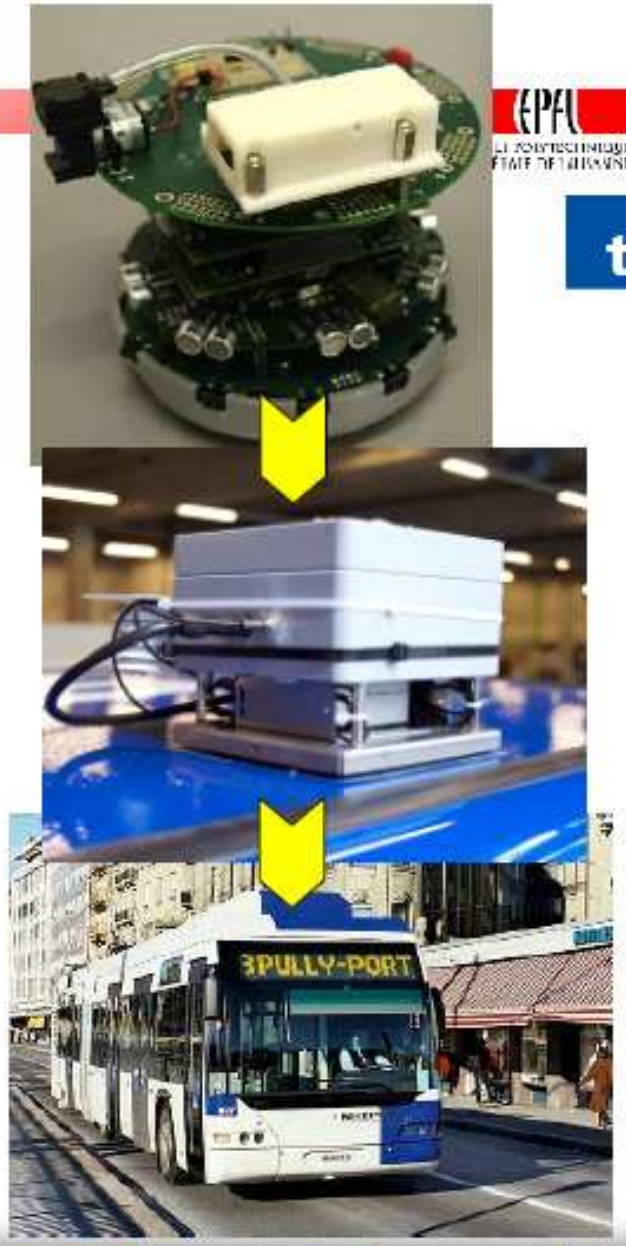
Coordinator Karl Aberer - EPFL

- Lausanne deployment

8 mobile stations

- NO_2, CO, CO_2, Humidity, Temperature
- Positioning module
- Communication: GSM

1 prototype station mounted on bus

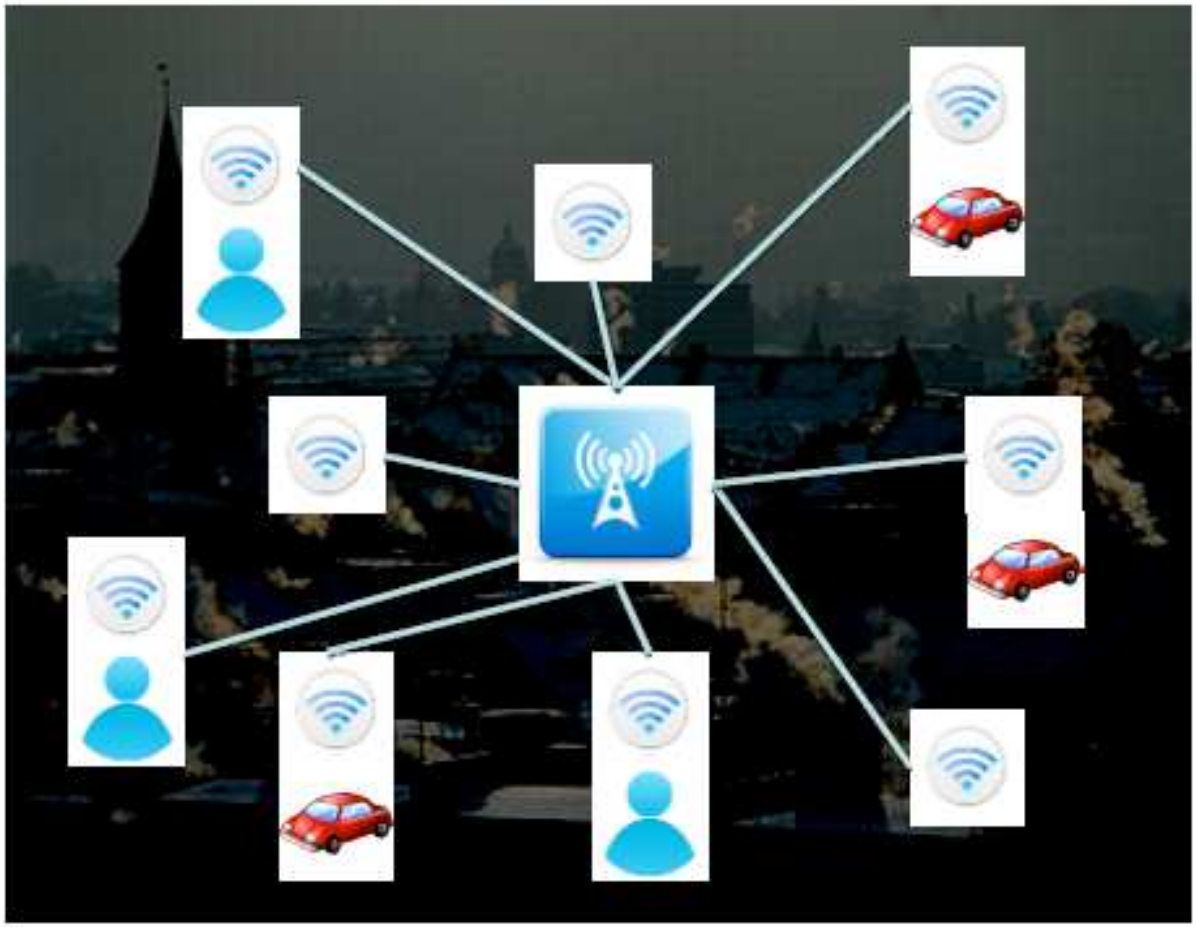


Courtesy by Danick Briand from IMT - samlab, EnviroMEMS, EPFL, Switzerland

Mobile Urban Sensors Network deployed at Lausanne (CH) - OPENSENSE Project

Opportunities

- ***Wireless communication and low cost sensors***: deploy larger numbers of stations
- ***Mobility***: deploy mobile stations to increase spatial coverage
- ***Communities***: citizens as data producers and information consumers



Courtesy by Danick Briand from IMT - samlab, EnviroMEMS, EPFL, Switzerland

Mobile Urban Sensors Network deployed at Lausanne (CH) - OPENSENSE Project

Air pollution monitoring

- **Sensing system**
  - With sufficient temporal and spatial resolution
  - With sufficient precision
  - At reasonable cost
- **Data analysis**
  - Interpolate air quality parameters from raw data
  - Ensure data quality
  - Reduce acquisition cost
- **User concerns**
  - Correlate with activity and mobility data
  - Consider privacy concerns
  - Provide individualized information
- **End-to-end system architecture**

Courtesy by Danick Briand from IMT - samlab, EnviroMEMS, EPFL, Switzerland

WHAT IS COST ?

COST is an intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research on a European level.

cost
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST has a very specific *mission and goal*.

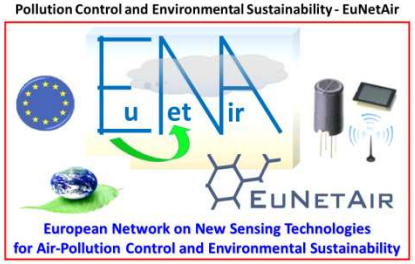
It contributes to reducing the fragmentation in European research investments and opening the European Research Area to cooperation worldwide.

MISSION OF A COST ACTION

As a precursor of advanced multidisciplinary research, COST plays a very important role in building a European Research Area (ERA). It anticipates and complements the activities of the EU Framework Programmes, constituting a "bridge" towards the scientific communities of emerging countries. It also increases the mobility of researchers across Europe and fosters the establishment of scientific excellence in the nine key domains:

- Biomedicine and Molecular Biosciences
- Food and Agriculture
- Forests, their Products and Services
- Materials, Physics and Nanosciences
- Chemistry and Molecular Sciences and Technologies
- Earth System Science and Environmental Management
- Information and Communication Technologies
- Transport and Urban Development
- Individuals, Societies, Cultures and Health

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



In addition, Trans-Domain Proposals allow for broad, multidisciplinary proposals to strike across the nine scientific domains.

Eligible Costs and Reimbursement Rules

Costs are incurred along these following categories:

- **Travel and subsistence allowances for meeting participants**
- **Organisation of meetings (Local Organiser Support)**
- **Short-Term Scientific Missions (STSMs)**
- **Training Schools**
- **Dissemination, e.g. Scientific Publication, Action website, Action promotion for Meetings and Training Schools, Communication, Outreach activities**
- **Other Expenses Related to Scientific Activities (such expenses need an approval from the COST Office)**
- **Financial and Scientific Administration and Coordination of the Action (*Fee up to 15% of the actual science expediture*)**

NO FUNDING FOR RESEARCH !!

Estimated TOTAL BUDGET for 4 Years: € 560.000

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

EuNetAir

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

HISTORY: SELECTION STEPS FOR COST ACTION *EuNetAir*

- OPEN COST CALL: ***5 FEBRUARY 2011***
- COLLECTION DATE FOR FIRST STAGE PROPOSAL: ***25 March 2011***

  ABOUT 2000 PROPOSALS IN THE 10 COST DOMAINS
- INVITATION FOR FULL PROPOSAL: ***15 MAY 2011***

  80 PROPOSALS INVITED TO SUBMIT FULL PROPOSAL

  Score EuNetAir: 31.64/36.00 (88%) - Threshold: 25/36 (70%)
- DEADLINE FOR FULL PROPOSAL: ***29 JULY 2011***

  FULL PROPOSAL EUNETAIR SUBMITTED !

  Score EuNetAir: 69/75 (92%) - Threshold: 55/75 (73%)
- HEARINGS AT TRANS-DOMAIN COMMITTEE: ***30 SEPTEMBER 2011***

  5 TD PROPOSALS INVITED TO HEARINGS at BRUSSELS:

  3 TD PROPOSALS SHORTLISTED TO BE APPROVED:

  (EuNetAir ranked to 3rd place) approved together 30 new Actions *by Committee of Senior Officials (CSO) Meeting on 1 DECEMBER 2011*
- **KICK-OFF MEETING OF ACTION *EuNetAir*: *16 MAY 2012 !!***

COST ACTION *EuNetAir*: *WHY* ?

PROPOSED SOLUTION

Networking of Coordinated Action on Integrated and Multidisciplinary Scale of Science and Technologies:
NANOMATERIALS, GAS SENSORS, WIRELESS TECHNOLOGY,
AIR-QUALITY MODELLING, STANDARDS & PROTOCOLS

TARGETED OPEN PROBLEMS

- AIR QUALITY CONTROL
- INDOOR/OUTDOOR ENERGY EFFICIENCY
- ENVIRONMENTAL SUSTAINABILITY
- CLIMATIC CHANGES MONITORING
- HEALTH EFFECTS OF AIR-POLLUTION

EuNetAir

BENEFIT & IMPACT

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

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

European Leadership on AQC Science & AQC Technologies
Development of Green-Economy
Support to Sustainable Development
Monitoring System for Clean Air for Europe

ACTION *EuNetAir* KEY ISSUES

- Research and Development on **New Sensing Technologies for low-cost Air-Pollution Control** through field studies and laboratory experiments.
- Innovation and Transfer of the results in **preventive real-time control practises** and **global sustainability for monitoring climate changes** and **outdoor/indoor energy efficiency**.
- Networking of international experts and Coordination of AQC Research for **development of new environmental technologies** and **industrial applications**.

COST ACTION *EuNetAir*: AIM

Increase scientific and technological knowledge at integrated and multidisciplinary scale

to develop

- **Nanomaterials for AQC sensors**
- **Improved gas sensor systems & sensing microdevices**
- **Wireless Sensor Networks & Distributed Intelligence**
- **Air-Quality Modelling & Chemical Weather Forecasting**
- **New Protocols, Standards & Methods for AQC sensors**
- **Harmonisation of environmental measurements**
- **Guidelines for AQC systems & transducers**
- **Environmental Sustainability & Energy Efficiency**

in order to

implementation in real-world applications

support **green-economy of European Countries**

and *competitiveness of European SMEs*

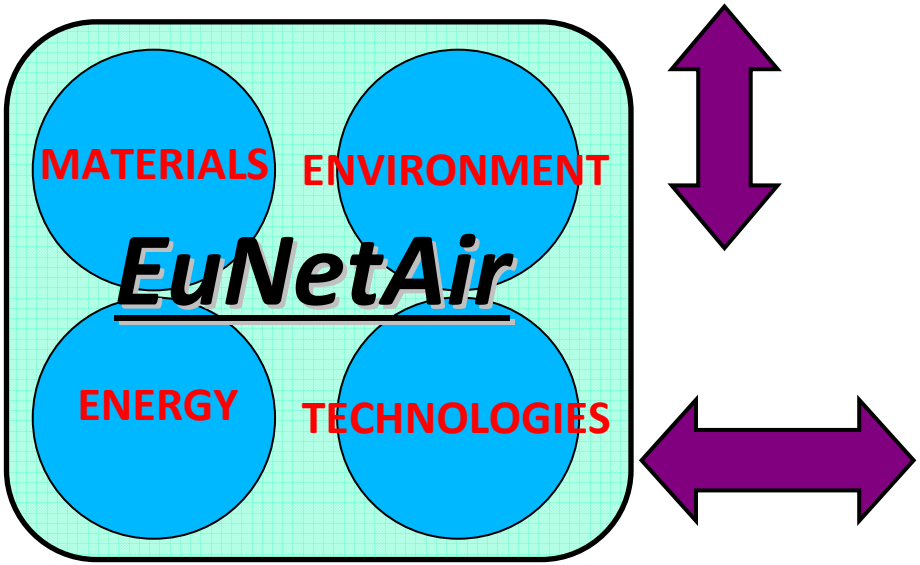
COST ACTION *EuNetAir*: OBJECTIVES

- ***Establishment*** of a ***Pan-European and multidisciplinary research*** and technological platform including research institutions, universities, agencies, industries, stakeholders and policy-makers.
- ***Achievement*** of a ***common understanding and knowledge*** at the European level of requirements on AQC and global sustainability.
- **Definition** of ***protocols and pre-standardised methods for AQC sensors*** and ***harmonisation of environmental measurements***.
- **Training** and involvement of ***Early Stage Researchers*** in the Coordinated Action at multidisciplinary style and international level.
- **Creation** of long standing ***collaborative research teams*** in the area of nanomaterials, AQC sensors and systems, AQ modelling, environmental measurements, standards and protocols for AQC, commercialisation of AQC sensors and environmental technologies.
- **Razionalization** of ***European research on AQC*** with emphasis on environmental sustainability and energy efficiency, ***including top-level worldwide collaborations***.
- **Promotion** of ***women's participation*** in S&T for ***gender balance***.
- **Dissemination** activities on AQC for ***sustainable development***.

COST Action EuNetAir: SPECIFIC FEATURES AND INNOVATION

Complementarity with other COST Actions:

- ES0602 Chemical Weather Forecasting and Information Systems
- MP0701 Composites with Novel Functional and Structural Properties by Nanoscale Materials
- MP0901 Designing Novel Materials for Nanodevices: From Theory to Practice
- TU0902 Integrated Assessment Technologies to Support the Sustainable Development of Urban Areas



RELATED FP6-FP7 PROJECTS:

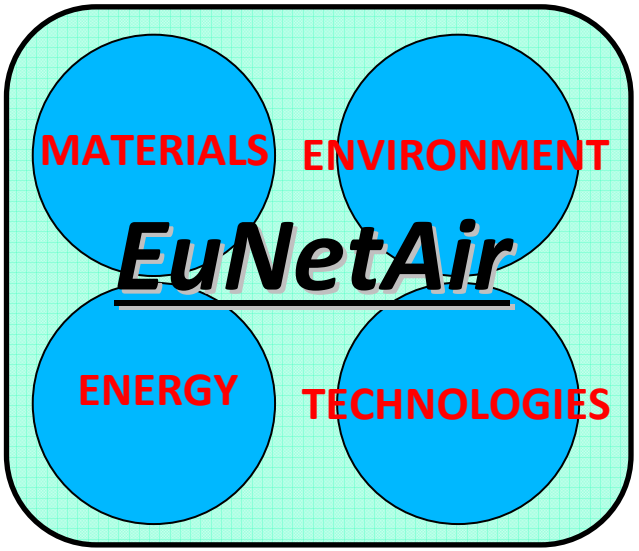
- NANOS4, NMP
- S3, EU-RUSSIA COOPERATION
- ORAMA, NMP
- NANO2HYBRIDS, NMP
- AIRMONTECH, ENV
- AQUILA, ENV
- OFFICAIR, ENV
- GOSPEL, Network of Excellence in Artificial Olfaction
- FLEXSMELL, PEOPLE Marie-Curie Action

INNOVATION of ACTION:

Integrated approach on **AQC** for environmental sustainability by **cooperative networking of multidisciplinary research** on nanomaterials, gas sensing technologies, wireless sensor technologies and networks, environmental measurements, ambient intelligence, air quality modelling, chemical weather forecasting, harmonisation of measurements, protocols, methods, standards and procedures for commercialisation of low-cost AQC sensors.

COST Action EuNetAir: Some National Research Projects

COST Action EuNetAir: EXPECTED IMPACT



Benefit of Concerted Action:
- Better integration of researches in the ERA on AQC
- Mutual enrichment, cross-validation and linking
- Identifying important areas for future AQC research
- Providing a flexible forum for planning future activities

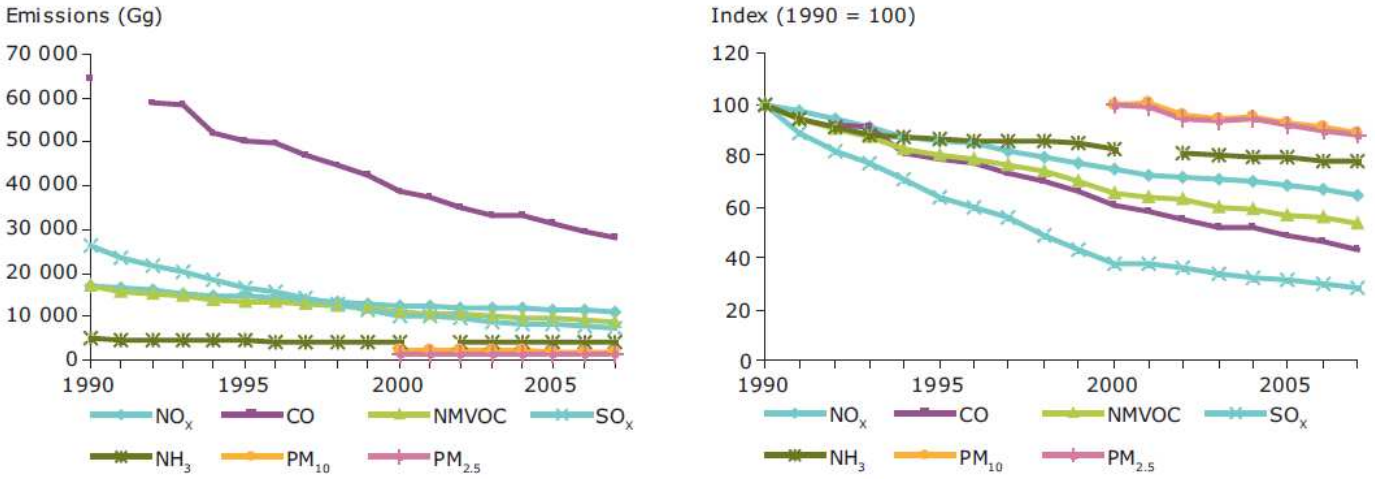
Benefit in Science & Technology:
- New sensing technologies
- Identification of sensing mechanisms
- Increased knowledge in nanomaterials for AQC sensors
- Improvement of sensor technologies
- Harmonisation of environmental measurements
- Standards, methods, protocols for calibration
- Experimental datasets for evaluating models in coordination

Benefit for Society:
- Sensing technologies for AQC at rural, remote, traffic, road networks in smart cities
- Improved AQ modelling and chemical weather forecasting
- Real-time mapping of Air Pollution by wireless sensor networks or GSM
- Innovation into preventive practises to monitor climate changes and outdoor/indoor energy efficiency

Specific scientific impacts of Action:
- A list of strengths and weaknesses of the existing knowledge-base
- Established strengthened communications between different research fields involved
- Enhanced connections with end-users and beneficiaries (citizens) of distributed AQ sensors technology
- A mid-to-long term common research agenda for the future

EuNetAir BACKGROUND: AIR QUALITY CONTROL

Figure ES1 EU-27 emission trends in absolute (Gg) and relative terms for NO_x, CO, NMVOCs, SO_x and NH_3 between 1990 and 2007 (index year 1990 = 100), and for PM_{10} and $PM_{2.5}$ between 2000–2007 (index year 2000 = 100)

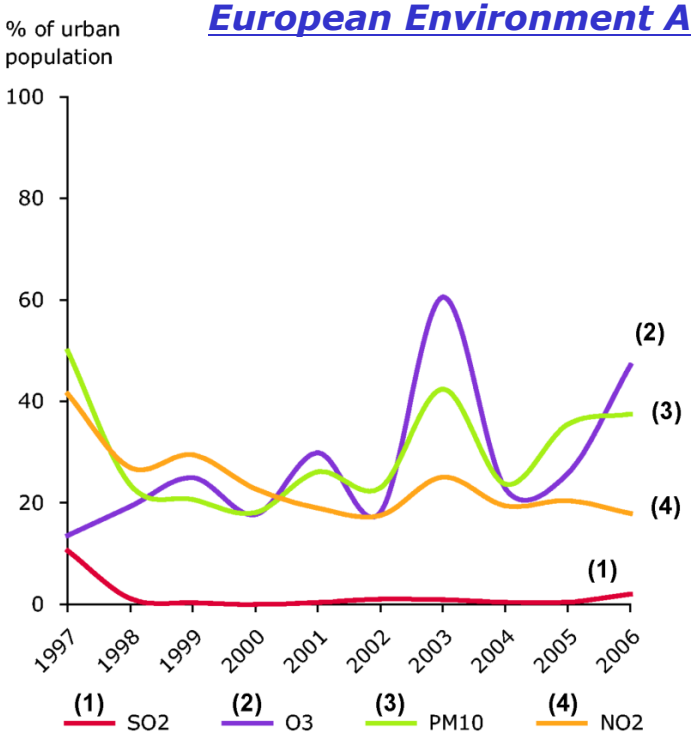


European Environment Agency, EEA Report 8/2009

Some Environmental Emergencies:

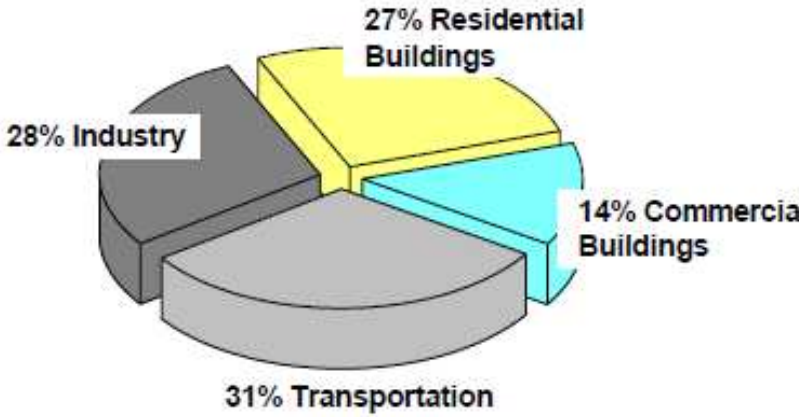
1930 - Meuse Valley (Belgium)
1952 - Great London Smog (UK)
1954 - Los Angeles (USA)
1984 - Bhopal (India)
2005 - Teheran (Iran)
2006 - Hong Kong (China)
2008 - Shanghai, Peking (China)
2009 - Taranto (Italy)
.....

AMBIENT AIR QUALITY
EU DIRECTIVE 2008/50/EC and Daughters



Pollutant	Limit Level
NO_x	100, 200 ppb
CO	8 ppm
SO_2	130, 190 ppb
O_3	120 μg/m³
PM_{10}	50 μg/m³
BTEX	6 μg/m³
PAH (BaP)	1 ng/m³
$PM_{2.5}$	-

EuNetAir BACKGROUND: INDOOR/OUTDOOR ENERGY EFFICIENCY



Primary energy consumption in the EU[1]

[1] ***O. Seppanen,***

11th Conference on Indoor Air Quality

2008, Copenaghen, Denmark

41% Primary Energy consumed in Buildings:

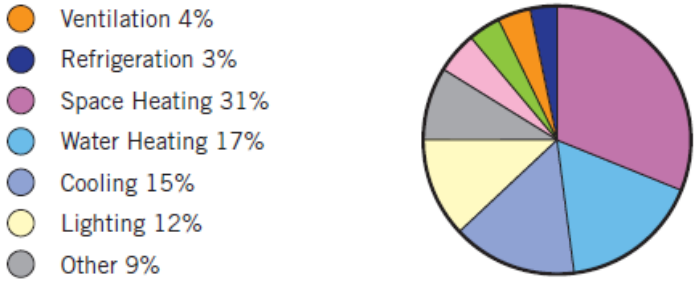
- **2/3 in Residential Buildings**
- **1/3 in Commercial Buildings**

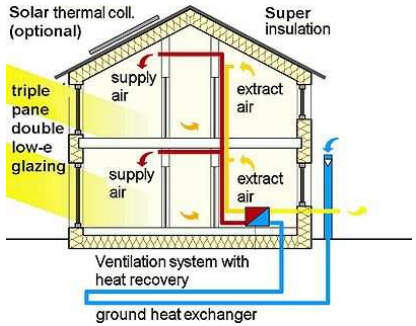
Energy Performance of Buildings EU Directive

EPBD 2010/31/EC

Figure 2 – Total Energy Consumption by End Use

Adapted from E Source, 2006





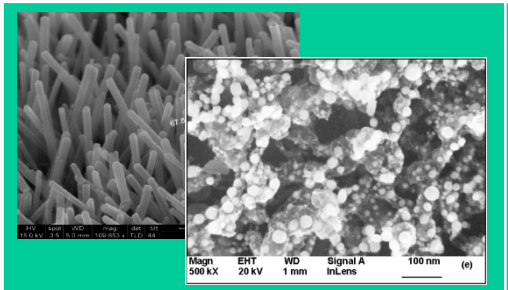
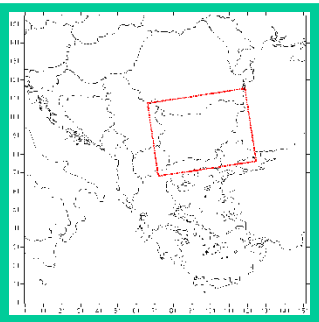
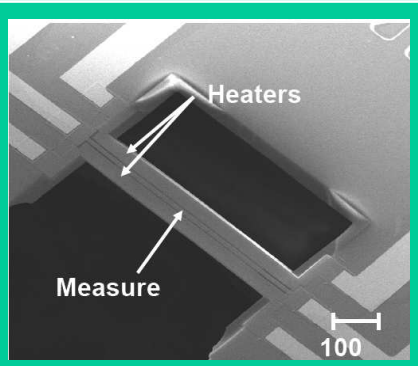
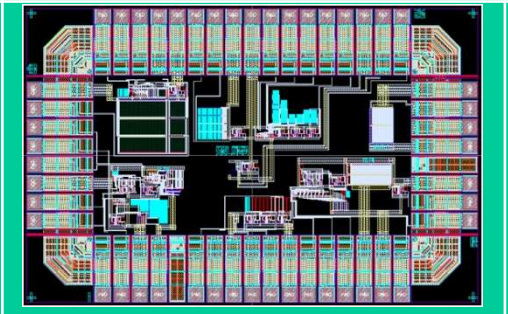
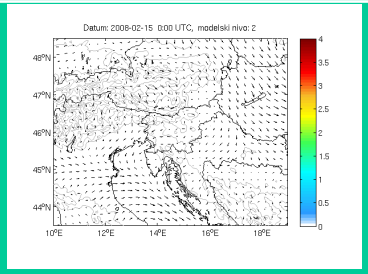
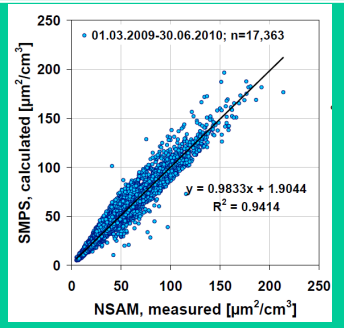
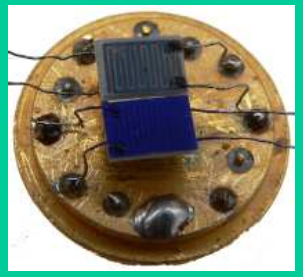
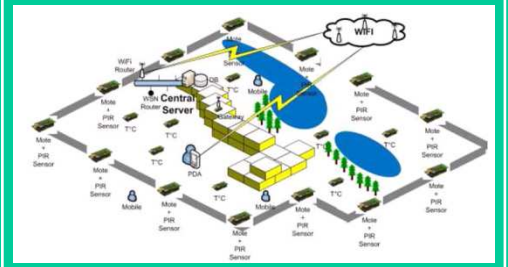
Source: Environmental Protection Agency's National Action Plan for Energy Efficiency Sector Collaborative on Energy Efficiency Hotel Energy Use Profile

Indoor Air		Typical Substances		Cure
Contamination Source	Emission Source	VOCs	Others	
• Human Being	• Breath	Acetone, Ethanol, Isoprene		demand controlled ventilation
		CO_2		
		Humidity		
	• Skin Respiration & Transpiration	Nonanal, Decanal, α-Pinene		
		Humidity		
	• Flatus	Methane, Hydrogen		
	• Cosmetics	Limonene, Eucalyptol		
	• Household Supplies	Alcohols, Esters, Limonene		
	• Combustion (Engines, Appliances, Tobacco Smoke)	Unburnt Hydrocarbons		
		CO		
		CO_2		
		Humidity		
• Building Material • Furniture • Office Equipment • Consumer Products	• Paints, Adhesives, Solvents, Carpets	Formaldehyde, Alkanes, Alcohols, Aldehydes, Ketones, Siloxanes		permanent 5-10% ventilation
	• PVC	Toluene, Xylene, Decane		
	• Printers, Copiers, Computers	Benzene, Styrene, Phenole		

Table 1 – Typical Indoor Air Contaminants (VOCs and others)

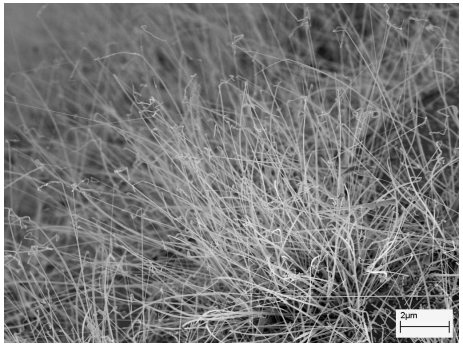
IAQ by WORLD HEALTH ORGANIZATION

COST Action EuNetAir: CHALLENGES

MATERIALS & GAS SENSORS	AQC SENSORS & SYSTEMS	AQ MODELLING	STANDARDS & PROTOCOLS
 MOX by UNIBS IREC UB SICCAS CNT by ENEA NASA URV CSIRO	 GasFET by EPFL, Switzerland	 CMAQ Calculations by NIMH, BG	 Dynamic Olfactometry (EN 13725/2003) by Univ. of Bari and Lenviros srl, IT
 Cantilever Sensor by DTU, DK	 ASIC Circuit: CMOS SOI by WARWICK & CCMOS Ltd, UK	 AQ Modelling dispersion in meteorological mesoscale by University of Ljubljana, SL	 Particle Surface Area Measurements by IUTA eV, DE
 Phtalocyanine Gas Sensors by CNRS UBP-LASMEA, FR	 WIRELESS SENSORS NETWORK by ISI, Greece	 Chemical Weather Forecasting and Information System by Hungarian Meteo Service	? **HARMONISATION:** Definition of protocols and standards for gas sensing measurements and gas sensors

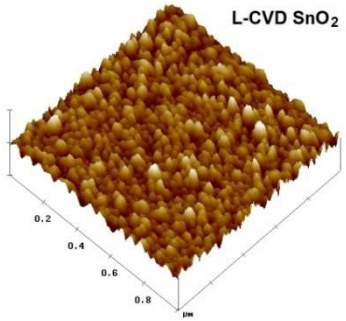
EuNetAir SOLUTIONS: NANOMATERIALS AND NANOTECHNOLOGIES

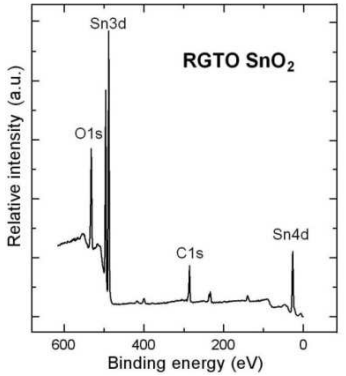
Metal Oxides Nanostructures by University of Brescia, Italy.



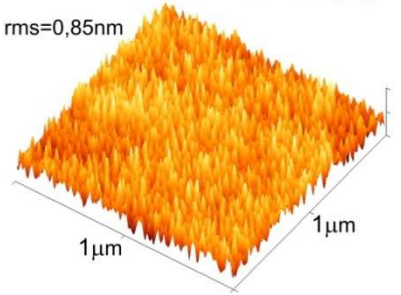
*The increasing scientific interest in **1-D systems** (**nanowires, nanobelts, nanorods, nanotubes**) and single-crystalline 1-D nanostructures (SnO_2, ZnO, WO_3, In_2O_3, MoO_3, TiO_2, etc.) are nowadays emerging as building blocks for a new generation of electronic, and optoelectronic **nanometer-scaled devices** with superior performances for gas sensing and energy applications.*

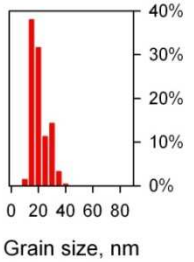
RGTO (RGVO) SnO_2 and In_2O_3 nanolayers by Silesian University of Technology, Poland

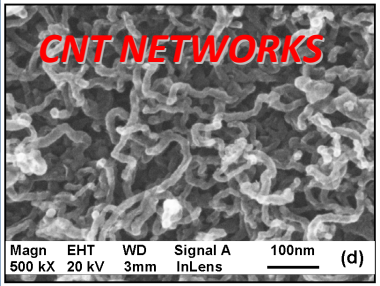


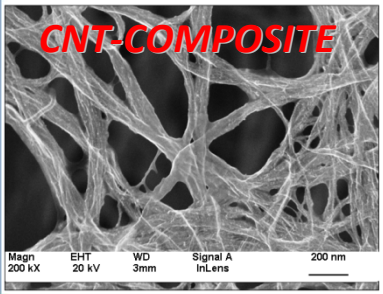


RGVO In_2O_3









Carbon nanotubes (CNT) in the form of networks and composite as filler in an organic matrix by ENEA, Italy.

PROPERTY OF CNTs	VALUE
High surface area	**100 - 1800 m^2/g**
Hollow structure	1 - 5 nm diameter
Nanosized morphology	10 - 1000 Aspect ratio
High electron mobility	up to 10000 cm^2Vs^{-1}, at 300K
High structural/chemical reactivity	Bending at high angle (< 40°)
High thermal stability	1800 - 6000 $Wm^{-1}K^{-1}$ therm. cond.
Electrical Resistivity	1 - 100 kΩ (p-type Semiconductor)

EuNetAir SOLUTIONS: WIRELESS TECHNOLOGY

Production version of the mote technology from EPSRC MESSAGE.

3 electrochemical gas sensors, temperature, humidity & noise.

IEEE 802.15.4 wireless mesh networking of up to 100 motes (up to 100 m between motes).

Custom network protocols for routing and power management.

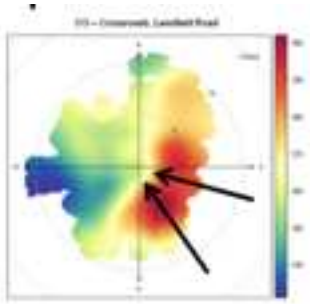
Solar rechargeable battery + Lithium D cell backup.

Designed for easy deployment on lighting columns etc.

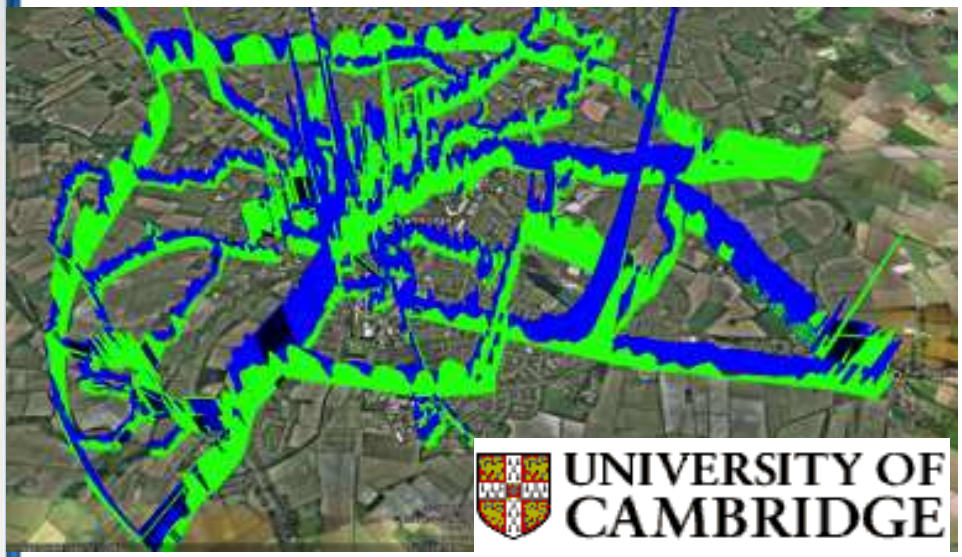
Low cost, rapid deployment and high spatial resolution.

The Envirowatch mote

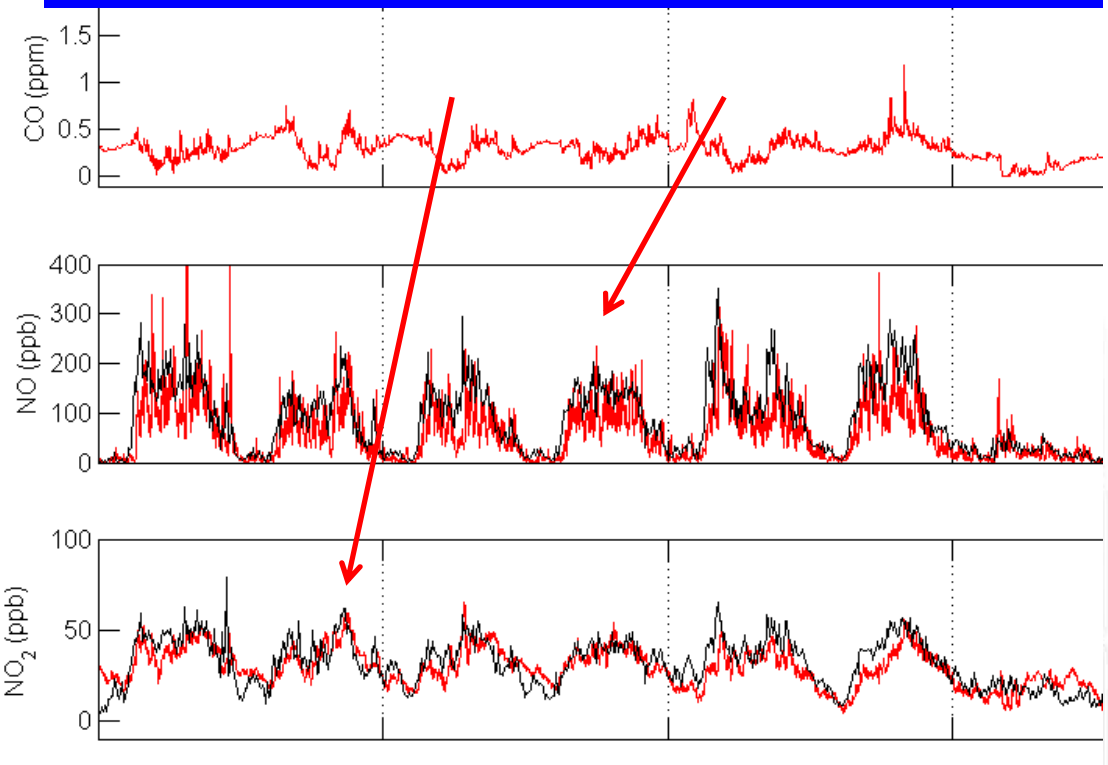
High granularity evaluation of air quality (e.g. NO_x, below), source attribution (right).



WIRELESS SENSORS NETWORK for AQC

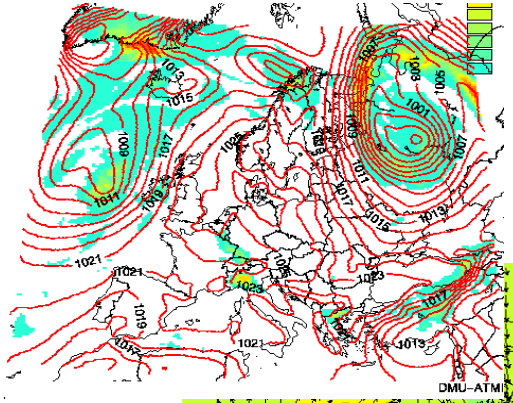


Automatically corrects mote electrochemical sensor data for temp and humidity (red) to achieve excellent agreement with precision instruments (black)

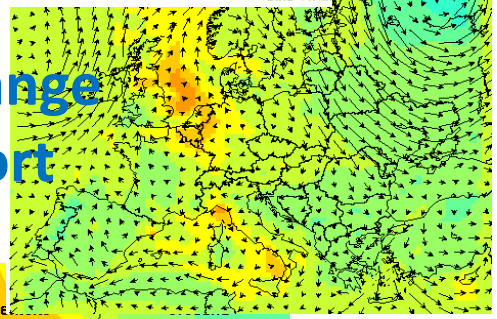


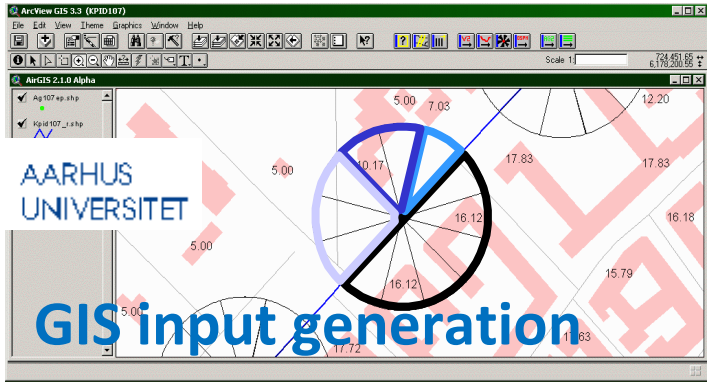
EuNetAir SOLUTIONS: AIR QUALITY MODELLING

Chemical weather



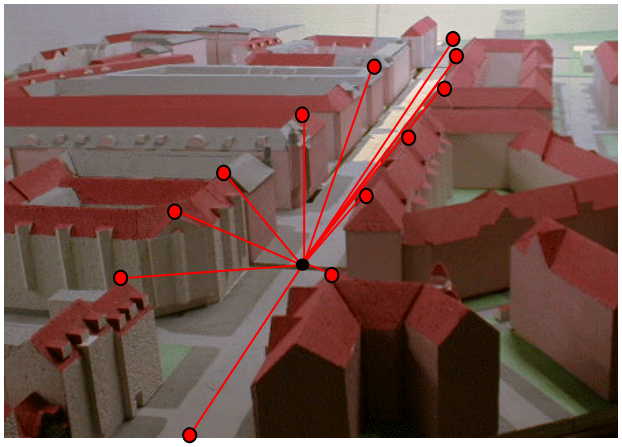
Long-range transport



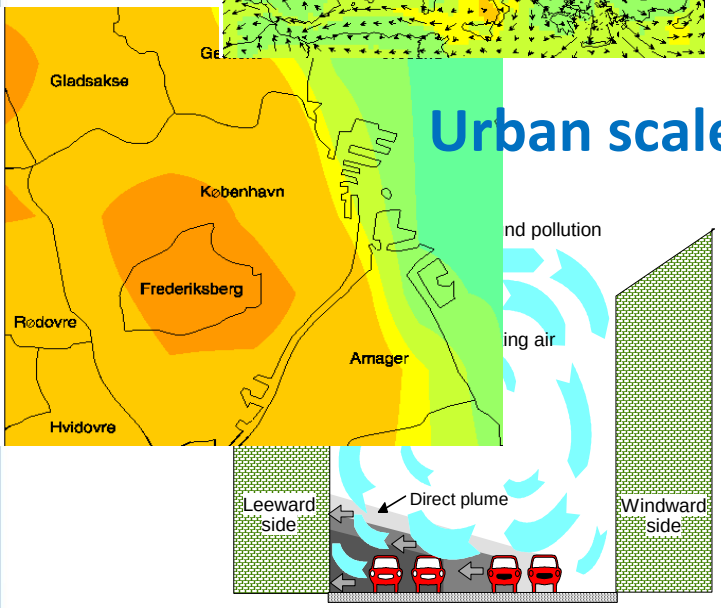


GIS input generation

Mapping addresses

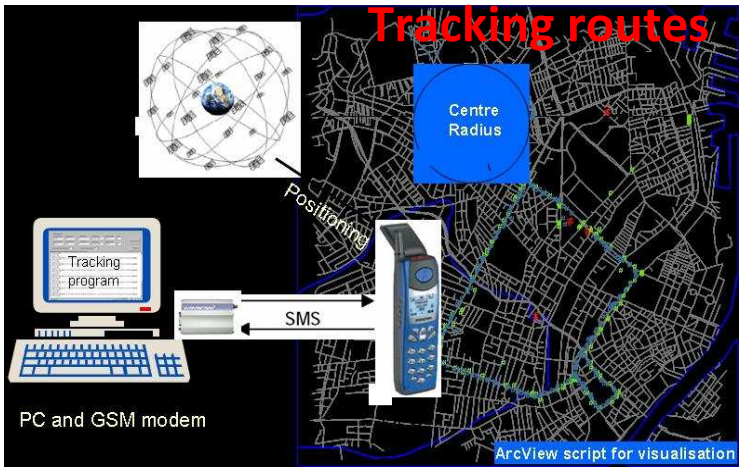


Urban scale



Street scale

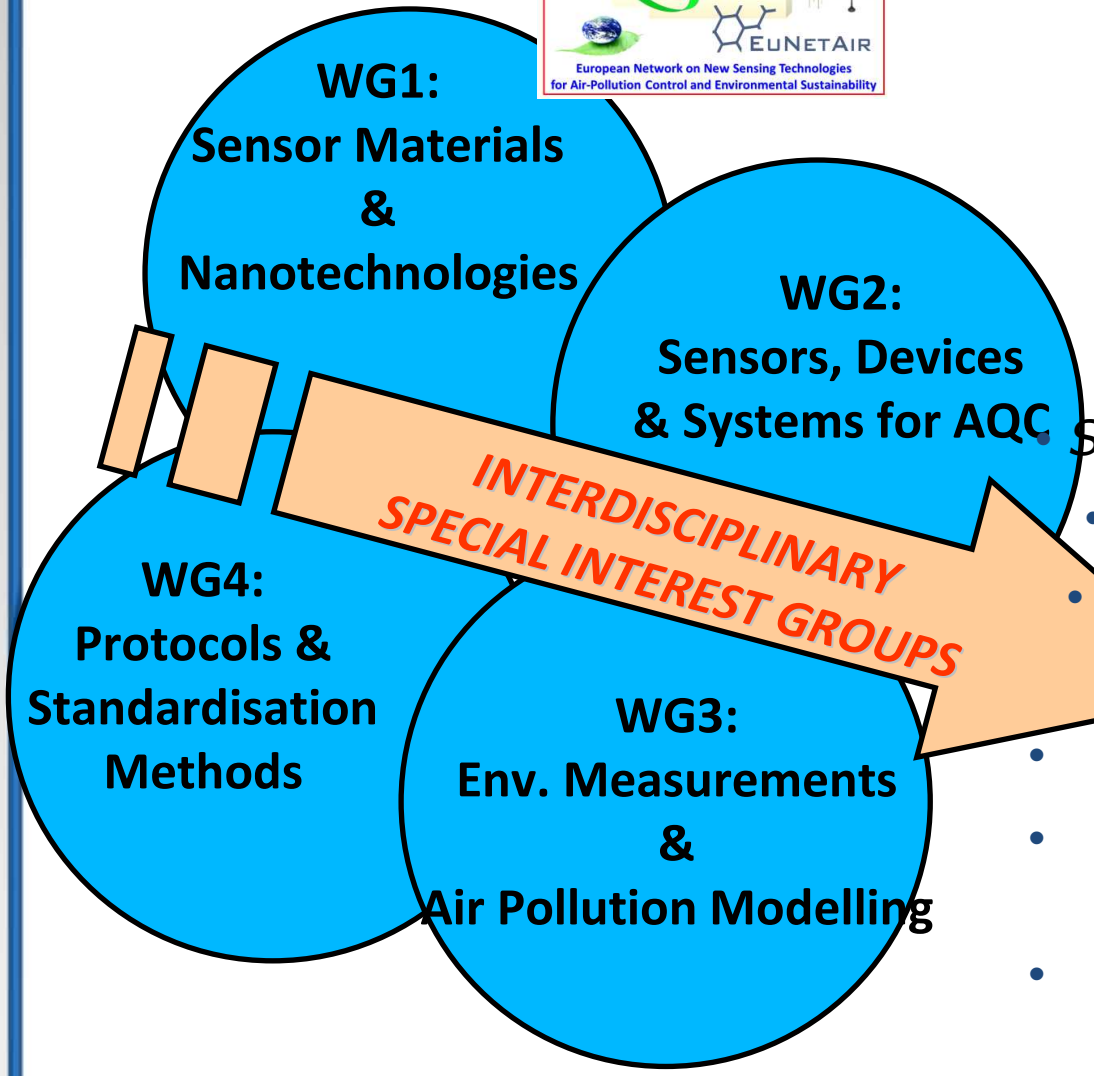
Tracking routes



AirTHESS: operational AQ management and information system for Thessaloniki, Greece, employing Computational Intelligence for **AQ forecasting** and **mobile phone technology** for early warning messages.

By Aristotle University, Greece.

COST Action TD1105 EuNetAir:
Working Groups (WGs) and Special Interest Groups (SIGs)



MANAGEMENT COMMITTEE:

CORE-GROUP and STEERING COMMITTEE

- *Editorial Board*
- *Dissemination*
- *Training Schools*
- *Gender Balance*
- *Early Stage Researchers (ESR)*
- *Short-Term Scientific Mission (STSM)*
- *Intellectual Property Rights (IPR)*
- *Local Organizing Committee (LOC)*

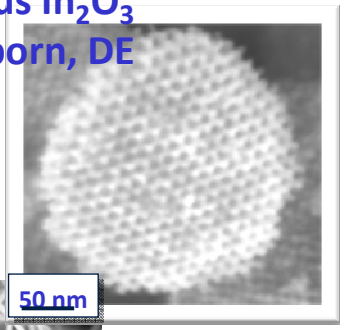
- **SIG 1**: *Network of Spin-offs*
- **SIG 2**: *Smart Sensors for Urban Air Monitoring in Cities*
- **SIG 3**: *Guidelines for Best Coupling Air Pollutant-Transducer*
- **SIG 4**: *Expert comments for the Revision of the Air Quality EU Directive*

COST - EuNetAir

WG1: Sensor Materials and Nanotechnology

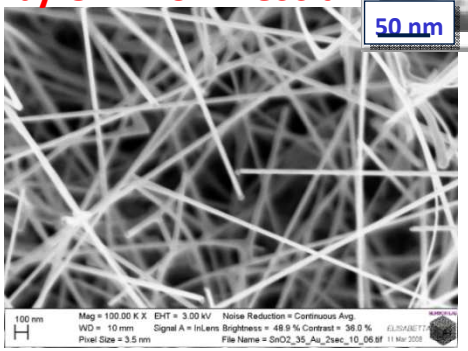
- **Sub-Working Group 1.1**: Metal oxides nanostructures for AQC gas sensors.
- **Sub-Working Group 1.2**: Carbon nanomaterials for AQC gas sensors.
- **Sub-Working Group 1.3**: Emerging sensor materials (organic/inorganic, hybrid, nanocomposites, polymers, functional, etc.).

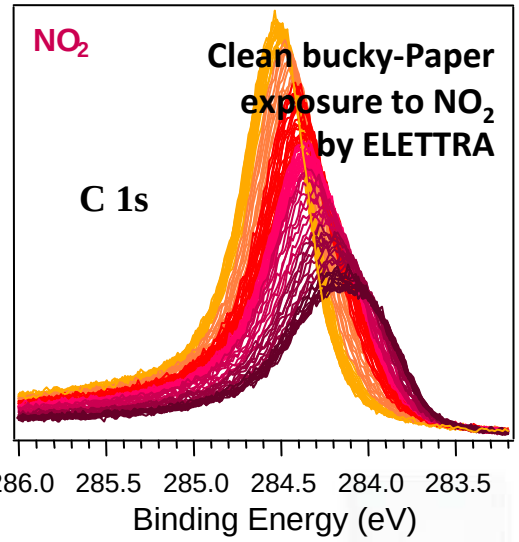
Mesoporous In_2O_3 by Univ. of Paderborn, DE



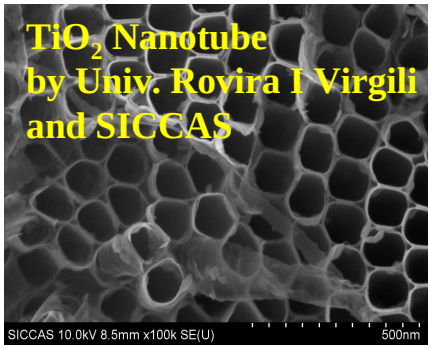
Self-heating SnO_2 Nanowires by Univ. of Barcelona

Metal oxide (SnO_2) Nanowires nets by Univ. of Brescia

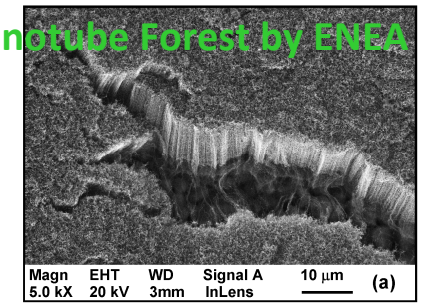


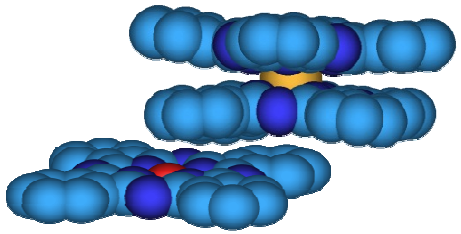


TiO_2 Nanotube by Univ. Rovira I Virgili and SICCAS



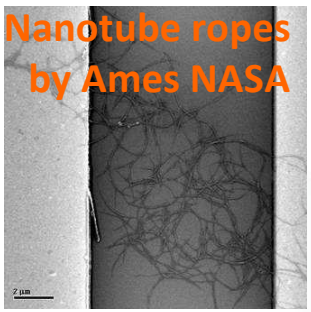
Carbon Nanotube Forest by ENEA



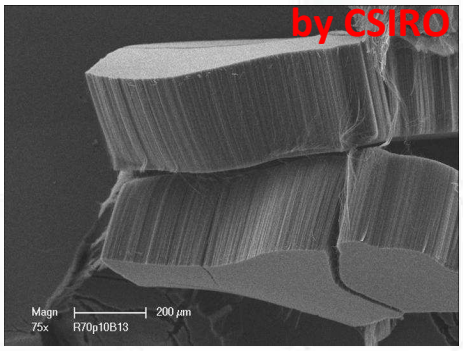


New molecular materials of polymer-macrocycles as transducers for polluting gas sensing by University of Bourgogne

Carbon Nanotube ropes by Ames NASA



Carbon Nanotube yarns by CSIRO



COST - EuNetAir

WG2: Sensors, Devices and Systems for AQC

- **Sub-Working Group 2.1**: Gas sensors and new transducers.
- **Sub-Working Group 2.2**: Portable gas sensor-systems.
- **Sub-Working Group 2.3**: Wireless technology and AQC sensors network.
- **Sub-Working Group 2.4**: Intelligence algorithms and distributed computing for networked AQC gas sensors.

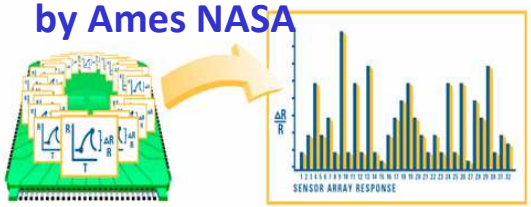
Warwick University in collaboration with Cambridge University, EPFL, PennState.

IT PATENT ENEA

Carbon Nanotube Gas Sensors

EnviroWatch mote by Newcastle University

by Ames NASA

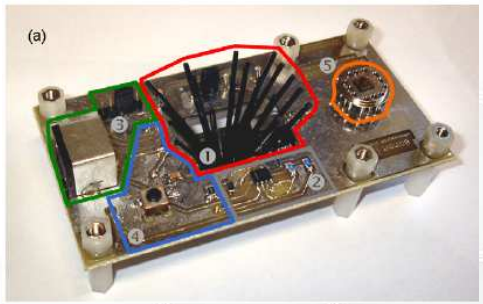


Using pattern matching algorithms, the data is converted into a unique response pattern

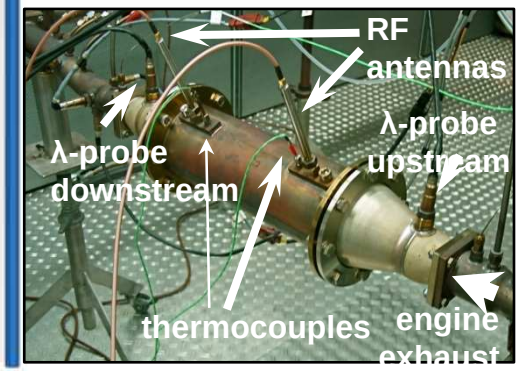
A versatile platform for the efficient development of gas detection systems based on automatic device adaptation by University of Saarland.

Environmental Sensor demo by IMEC, NL

Low-ppb sensitivity for NO_2 GaN-based sensor concept



Autonomous Gas Sensor System by IREC and Univ. of Barcelona



Direct status measurement of automotive catalysts by radio-frequency technique by University of Bayreuth, DE.

COST - EuNetAir

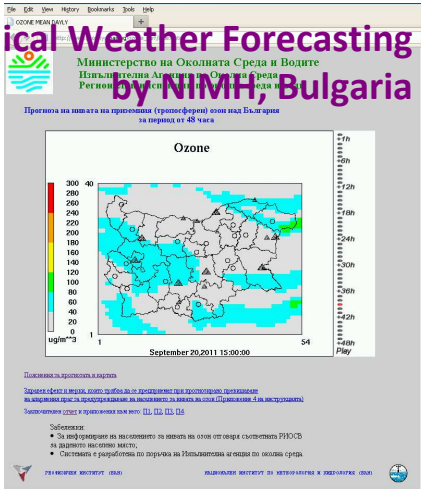
WG3: Environmental Measurements and Air-Pollution Modelling

- **Sub-Working Group 3.1**: Environmental measurements at laboratory and in field air-quality stations.
- **Sub-Working Group 3.2**: Air-quality modeling and chemical weather forecasting.
- **Sub-Working Group 3.3**: Harmonisation of environmental measurements

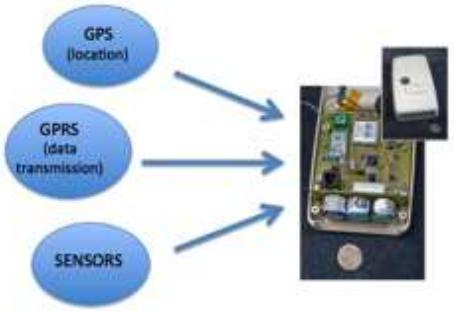
by Aristotle University, EL

AirMerge system for Chemical Weather Models

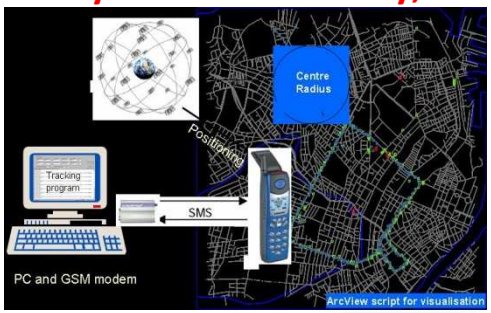
Chemical Weather Forecasting by NIMH, Bulgaria



Mobile and static sensor network configurations by University of Cambridge.



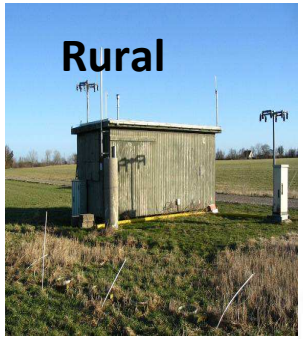
AQ Modeling: Tracking routes by Aarhus University, DK



Environmental measurements of PM and air pollution: Protocols and standardisation methods by CSIC, ES

Industrial

AQ monitoring station by ARPA-PUGLIA, IT



Rural

AQ monitoring station by Aarhus University, DK

Urban/Street

AQ monitoring station by Lithuanian EPA

COST - EuNetAir

WG4: Protocols and Standardisation Methods

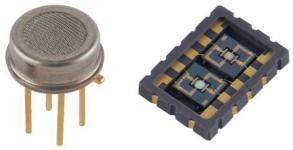
- **Sub-Working Group 4.1**: Protocols, standards and methods for AQC by analyzers/instruments (no-sensors) technologies.
- **Sub-Working Group 4.2**: Protocols, standards and methods for AQC by sensors (no-analyzers) technologies.
- **Sub-Working Group 4.3**: Benchmarking of new products and market of commercial AQC sensors.

European Directive 2008/50/EC: Ambient Air Quality

EU standard EN 13725/2003: Dynamic Olfactometry

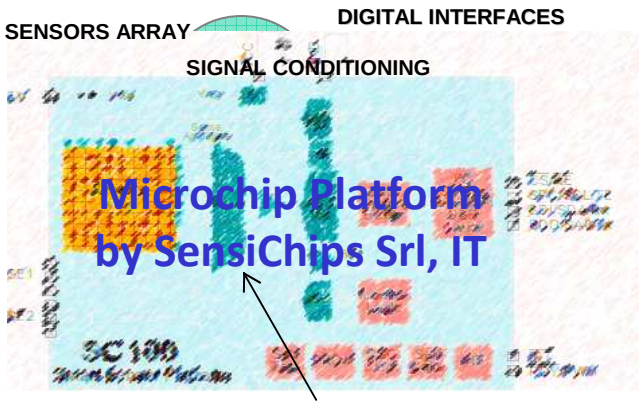
Protocols and Standardised Methods for Gas Sensors

Guidelines of Best Transducers applied to specific gases

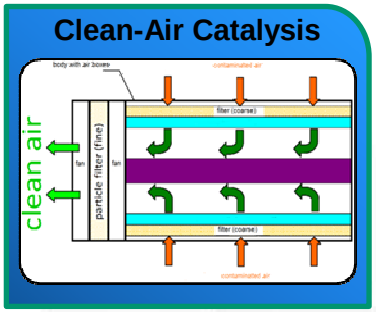


Packaged sensors by E2V, CH

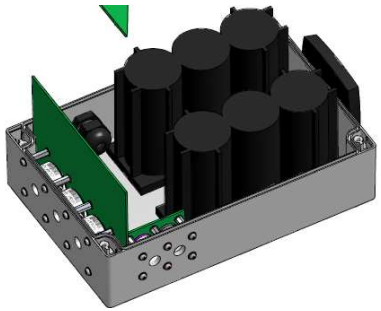
Dynamic olfactometry EN13725 by Univ. of Liege, Odometric SA, Univ. of Bari, Lenviros srl.



New precision multi-parametric analytical tool



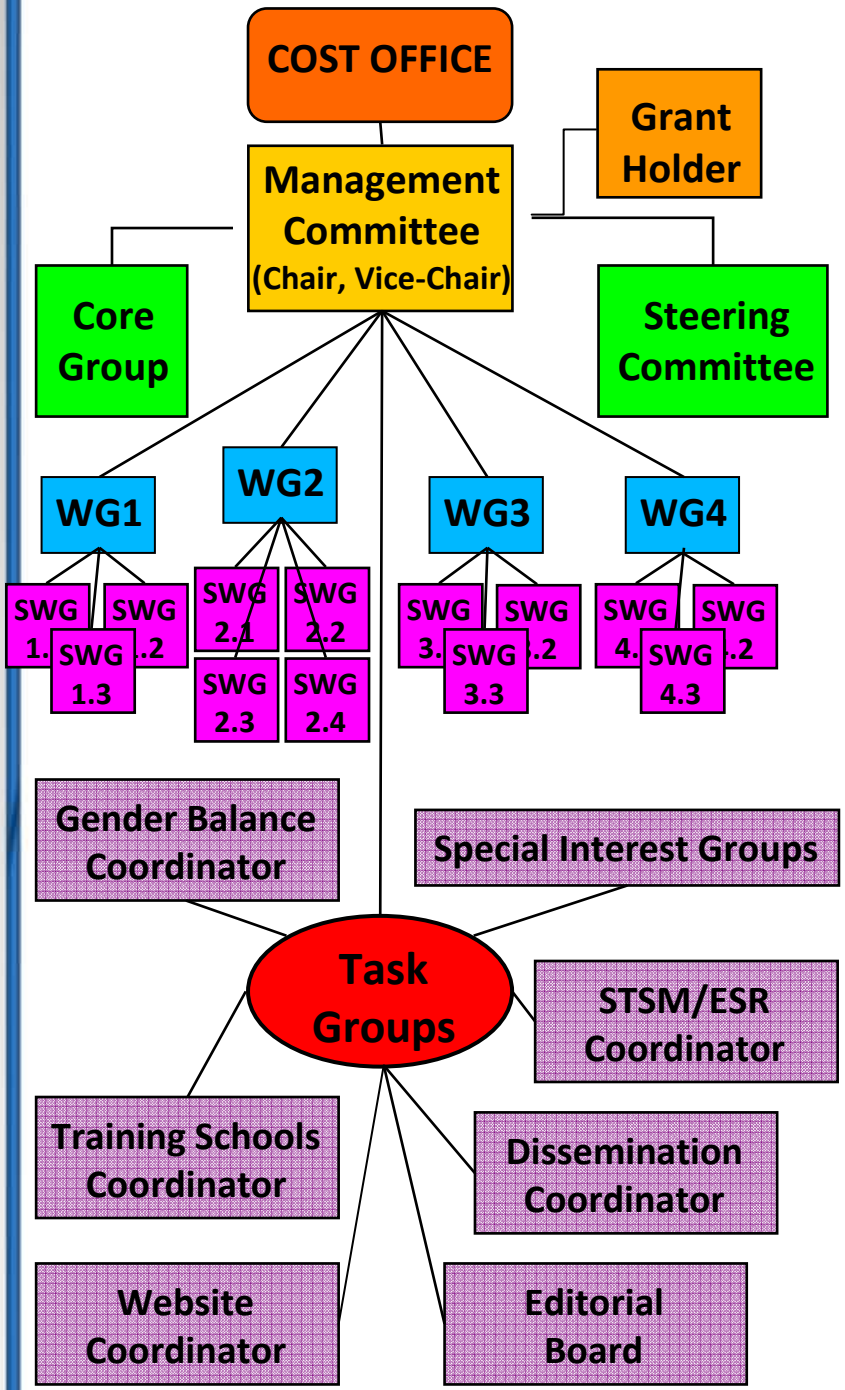
Becker Gruppe, DE



Battery-Powered Sensors by Alphasense Ltd, UK

CO_2 IR sensor for alarm System by SenseAir AB, Sweden

COST Action EuNetAir: COORDINATION AND ORGANIZATION



MANAGEMENT COMMITTEE

2 Representatives of participating Countries

Steering Committee:
- ✓ *Action Monitoring*
- ✓ *Milestones settings*
- ✓ *Prepare MC meetings*
- ✓ *Management of IPR issues*

Core Group:
- ✓ *Prepare Documents for MC*
- ✓ *Prepare MC meetings*
- ✓ *Executive tasks in Action*

- Meet every 6 months
- S&T exchange
- Cooperation
- Researcher mobility (STSM)
- Budget management
- Report to COST Office
- Organize Workshops/Conferences
- Organize Training Schools
- Promote Gender Balance
- Action Results Dissemination
- Evaluation plans

CORE GROUP

Action Chair
Action Vice Chair
Secretary

WGs Coordinator
- *Organize WG meetings*
- *Coordination*
- *Monitoring*
- *Promote joint-activities*
- *Report to MC and SG*

STSM/ESR Coordinator
- STSM/*ESR agenda*
- *Training agenda*

Gender Coordinator
- *Gender agenda*
- *Care for gender balance*

Dissemination Coordinator
- *Dissemination activities*
- *Action Website*
- *Local Organizing Committee*

NETWORKING
- *Special Interest Groups (SIGs)*
- *Network of spin-offs*
- *International Experts*
- *Keynote Speakers*

COST Action EuNetAir: EARLY STAGE RESEARCHERS

The Action adopts the "***COST Strategy towards increased support for Early Stage Researchers***" - *COST 295/09* giving ESRs support and measures like STSMs, Training Schools, Action Think Thank, Conference Grants, inclusion of ESR as WGs Chair, ESRs as national MC delegates.

In order to increase visibility of ESRs in this COST Action:

- **ESR Coordinator** will be preferably one of the *ESRs MC-members*
- Nomination of an **ESR as WG Coordinator** will be encouraged
- Workshop participation of ESRs
- Selection of **best independent ideas** from ESRs will be awarded with ***grants for participation in S&T events***
- ***Invitation*** of high schools and University students to the *training sessions and training schools*
- ***Social Scientific Network services*** based on free web software to promote cohesion inside ESRs community in order to outline needs and overcome
- Proposals to ***European Research Council - Starting Independent Research Grant*** from Action ESRs will be encouraged

COST Action EuNetAir: GENDER BALANCE

At the moment **20% of the participants are female** with the final aim to reach hopefully up to ***50% female participation***.

In this COST Action:

- **Gender Coordinator** will be preferably one of the *female MC-members*
- Female Nomination in Working Groups and Sub-Working Groups, including **WG Coordinator**, will be encouraged
- ***Female scientist will be encouraged to top-management***
- ***Networks of women in S&T***
- ***Career advice of women***
- ***Set target numbers and quotas***
- ***Awards for women in S&T***
- ***Childcare supports (travel with children)***
- ***Support for female scientists with family***

COST Action EuNetAir: DISSEMINATION

Target Audience

- *Research community*
- *Industry*
- *End-users*
- *Environmental agencies*
- *Policy makers and regional planners*
- *International organizations*
- *Students and Early Stage Researchers*
- *General Public*
- *Local and Government Authorities*

Publications

- *State-of-the-Art on AQC*
- *Roadmap for future research on AQC technologies*
- *Guidelines for Transduction Methods on AQC*
- *Books and Reviews*
- *Scientific and Technological Joint-Publications*
- *Non-Technical Publications*

Methods

- *Website*
- *Electronic communications*
- *Publications*
- *Meetings*
- *International Conferences*
- *Workshops and Side-Events*
- *Industrial Forum and ILOs*
- *Training Schools*
- *Short Term Scientific Missions*
- *Media*

Other Partners interested to COST Action EuNetAir:

- **JRC Ispra**, Institute for Environment and Sustainability, EU
- **ARPA-PUGLIA**, Regional Environmental Protection Agency, IT
- **World Health Organization Europe**, by Centre for Air Quality Management and Air Pollution Control, Federal Environmental Agency, Germany.
- **VDI DIN**, Commission on Air Pollution Prevention Standard Committee, DE
- **European Environment Agency**, Copenaghen

COST Action EuNetAir: TIMETABLE

YEAR	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1	**M**: Kick-Off Meeting. MC Meeting 1. **D**: MC setup and Action Workplan established	**M**: Editorial Board for Leaflet, Brochure, Newsletter. Action website setup. **D**: Definition of WGs and WGs Workplans	**M**: MC Meeting 2. WGs Meeting 1. **D**: Scientific activities, ESR/STSM program, Dissemination	**M**: Workshop 1. Training School 1. State-of-Art on AQC. **D**: Evaluation and Activity Report.
2	**M**: MC Meeting 3. WGs Meeting 2. Update Action website. **D**: Scientific activities. Liason with EU Programs	**M**: Editorial Board meeting. ESR/STSM. **D**: Dissemination. Newsletter. Reporting	**M**: MC Meeting 4. WGs Meeting 3. Workshop 2. Training School 2. **D**: S&T strategies	**M**: **International Conference 1**. Edit. Board. ESR/STSM. **D**: Dissemination. Reporting
3	**M**: MC Meeting 5. WGs Meeting 4. **D**: Dissemination. Strategies & Activities	**M**: Edit. Board: State-of-art AQC. ESR/STSM **D**: Dissemination. Strategies. Reporting	**M**: MC Meeting 6. WGs Meeting 5. Workshop 3. Training School 3. **D**: S&T strategies	**M**: Edit. Board: Newsletter. ESR/STSM **D**: Dissemination. Reporting
4	**M**: . MC Meeting 7. WGs Meeting 6. **D**: S&T strategies. Link to EU programs, Industry	**M**: Workshop 4. Training School 4. **D**: Dissemination. ESR/STSM. S&T strategic activity.	**M**: WGs Meeting 7. **D**: S&T strategies and activities. ESR/STSM. Dissemination	**M**: **International Conference 2**. MC Meeting 8. **D**: Final Evaluation. Reporting

M: **Milestones** **D**: **Deliverables**

ROADMAP 2012-2016. Year 1: 1 July 2012 - 30 June 2013

***Start of Action TD1105*: Kick-off Meeting on 16 May 2012**

YEAR	MILESTONES	DELIVERABLES
Year 1 from 07/2012 to 06/2013	**Quarter 1**: **July 2012 - September 2012** Kick-off Meeting. MC setup. Action Workplan established. MC Meeting 1. **Quarter 2**: **October 2012 - December 2012** Action website setup. Start-up of Editorial Board for Leaflet, Brochure, Newsletter. **Quarter 3**: **January 2013 - March 2013** MC Meeting 2. WGs Meeting 1. Scientific activities. **Quarter 4**: **April 2013 - June 2013** Scientific strategies: State-of-art on AQC. Training School organization. Workshop organization.	**Quarter 1**: **July 2012 - September 2012** MC setup Action Workplan established. **Quarter 2**: **October 2012 - December 2012** Definition of WGs and WGs Workplans. *Newsletter*: Issue 1. *Leaflet/Brochure*: Release 1. **Quarter 3**: **January 2013 - March 2013** Publication of the List of EuNetAir Action R&D *Infrastructures* and main *Facilities*. Scientific Activities. ESR/STSM Report and Dissemination. **Quarter 4**: **April 2013 - June 2013** Action website fully operational with publication of *Curricula* of partners. *Newsletter*: Issue 2. ***State-of-Art on AQC tech***: Release 1. *Training School 1*. *Workshop 1*. *Annual Report*.

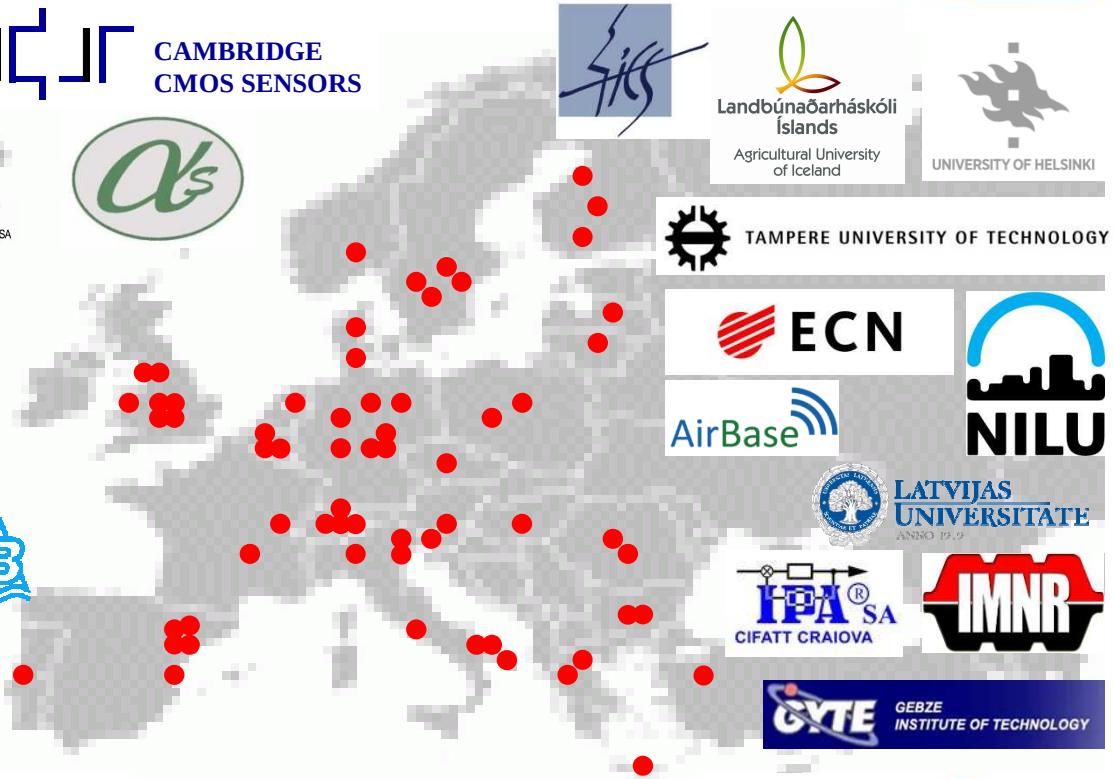
COST Action *EuNetAir*: ROADMAP 2012-2016 and GANTT

YEARS	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	Y3	Y3	Y3	Y3	Y4	Y4	Y4	Y4
QUARTERS	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
REAL TIME - START (MM.YY)	07.12	10.12	01.13	04.13	07.13	10.13	01.14	04.14	07.14	10.14	01.15	04.15	07.15	10.15	01.16	04.16
REAL TIME - STOP (MM.YY)	09.12	12.12	03.13	06.13	09.13	12.13	03.14	06.14	09.14	12.14	03.15	06.15	09.15	12.15	03.16	06.16
WG1 Activities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG2 Activities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG3 Activities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG4 Activities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Kick-Off Meeting	X															
Establish Workplan	X															
Action Website Setup/Update		X			X			X			X			X		X
Action Leaflet & Brochure		X						X								X
Newsletter		X		X		X		X		X		X		X		X
Workshop				X			X				X			X		
Training School				X			X				X			X		
Annual/Final Report				X				X				X				X
State-of-Art				X						X						X
Exchange Visits: STSMs			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exchange Visits of ESRs			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Campaigns					-	-	-	-	-	-	-	-	-	-	-	-
Mutual Publications	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
International Conference								X								X
WGs Meeting			X		X		X		X		X		X		X	
MC Meeting	X		X		X		X		X		X		X			X

COST Action: EuNetAir PARTICIPANTS

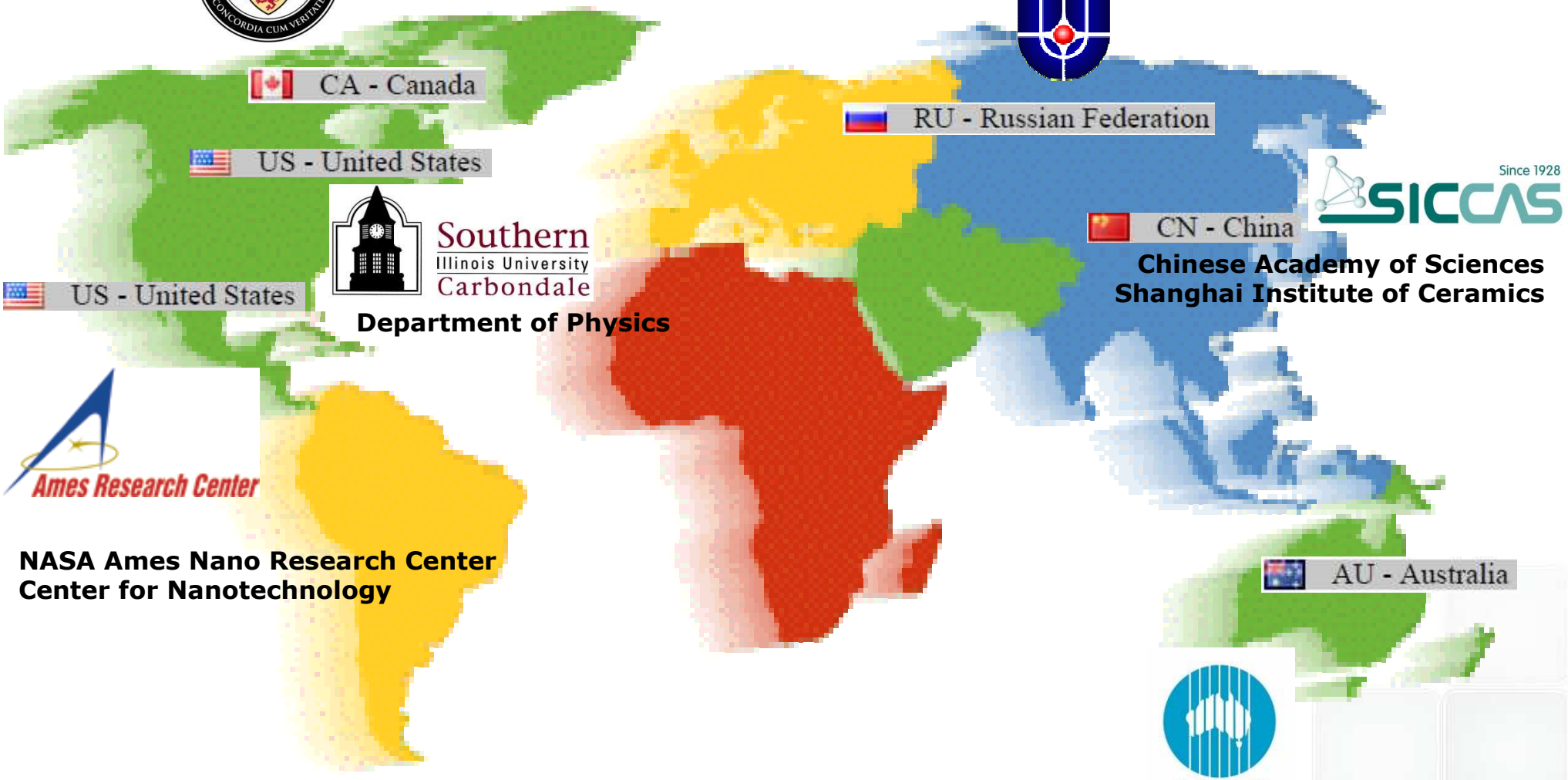
BE - Belgium	VITO, Universitè de Liège, Odometric S.A.
BG - Bulgaria	National Institute of Meteorology and Hydrology - BAS; Institute of Electronics - BAS
CH - Switzerland	Ecole Polytechnique Fèdèrale de Lausanne; e2v Microsensors S.A.; EnvEve S.A.; EMPA
CZ - Czech Republic	Institute of Computer Science, Academy of Sciences of the Czech Republic
DE - Germany	Institute of Energy and Environmental Technology – IUTA eV; Saarland University; University of Bayreuth; University of Paderborn; UST GmbH; Alfred Becker GmbH; 3S GmbH
DK - Denmark	Aarhus University; Technical University of Denmark - DTU
EL - Greece	Aristotle University; Foundation of Research and Technology; Industrial Systems Institute
ES - Spain	Catalonia Institute for Energy Research - IREC; Spanish National Research Council - CSIC; University Rovira i Virgili; University of Barcelona, Worldsensing S.L.
FI - Finland	University of Oulu; University of Helsinki; Tampere University of Technology
FR - France	University of Bourgogne; University Blaise Pascal
HU - Hungary	Hungarian Meteorological Service
IS - Iceland	Agricultural University of Iceland
IL - Israel	AirBase Systems
IT - Italy	ENEA; ELETTRA; Univ. of Bari; Univ. of Brescia; Univ. of Trieste; Lenviros srl; Sensichips srl
LT - Lithuania	Lithuania Environmental Protection Agency
LV - Latvia	University of Latvia
NL - Netherlands	IMEC - Holst Centre; ECN
NO - Norway	NILU - Norwegian Institute for Air Research
PL - Poland	Silesian University of Technology; Warsaw University of Life Science
PT - Portugal	University of Coimbra
RO - Romania	National R&D Institute for Nonferrous and Rare Metals; SC IPA SA - Research & Development
SE - Sweden	Linkoping University; Chalmers University of Technology; SenSiC AB; SenseAir AB
SI - Slovenia	University of Ljubljana; Aerosol d.o.o.
UK - United Kingdom	Imperial College London; Newcastle University; University of Manchester; University of Cambridge; University of Warwick; Cambridge CMOS Sensors Ltd; Alphasense Ltd
TR - Turkey	GEBZE Institute of Technology

COST Action EuNetAir PARTICIPANTS



vito vision on technology
Université de Liège
Arlon campus environnement
ODOMETRIC
CAMBRIDGE CMOS SENSORS
Landbúnaðarháskóli Íslands Agricultural University of Iceland
UNIVERSITY OF HELSINKI
TAMPERE UNIVERSITY OF TECHNOLOGY
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
e2v
ENVEVE SA
EMPA Materials Science & Technology
FM FUNCTIONALMATERIALS
ECN
AirBase
NILU
iuta
UNIVERSITÄT DES SAARLANDES
UNIVERSITÄT PADERBORN Die Universität der Informationsgesellschaft
LATVIJAS UNIVERSITĀTE
3S Gas sensing solutions
UST UMWELT SENSOR TECHNIK
BECKER GRUPPE
IPA SA CIFATT CRAIOVA
IMNR
AARHUS UNIVERSITET
DTU
Aristotle University Thessaloniki
GYTE GEBZE INSTITUTE OF TECHNOLOGY
FORTH Foundation for Research & Technology - Hellas
I.S.I. Industrial Systems Institute
IREC Institut de Recerca en Energia de Catalunya Catalonia Institute for Energy Research
MINISTERIO DE CIENCIA E INNOVACIÓN
CSIC
UNIVERSITAT DE BARCELONA
UNIVERSITAT ROVIRA I VIRGILI La universitat pública de Tarragona
world sensing
UNIVERSITY of OULU OULUN YLIOPISTO
UNIVERSITÉ BLAISE PASCAL CLERMONT-FERRAND UBP
HMS
POLITECHNIKA ŚLĄSKA
imec
UNIVERSITÉ DE BOURGOGNE
ENEA AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE
elettra
UNIVERSITÀ DEGLI STUDI DI TRIESTE Dipartimento di Scienze Chimiche e Farmaceutiche
UNIVERSITAS STUDIORUM BRIXIAE
lenviros
sensichips
Univerza v Ljubljani
CHALMERS
SenseAir
SenSiC AB sensors for a clean environment
Aerosol
Linköpings universitet
Imperial College London
Newcastle University
UNIVERSITY OF CAMBRIDGE
WARWICK
MANCHESTER 1824

Non-COST EuNetAir PARTICIPANTS



University of Waterloo
Systems Design Engineering

National Research Center Kurchatov Institute
Institute of Applied Chemical Physics

Department of Physics

Chinese Academy of Sciences
Shanghai Institute of Ceramics

NASA Ames Nano Research Center
Center for Nanotechnology

Materials Science and Engineering

COST Action EuNetAir: List of Experts

(* *Reciprocal Agreement*)

Total of Experts: **101** from **24** COST Countries and **5** Non-COST Countries

BE - Belgium
Prof. Anne-Claude ROMAIN
Dr. Jan THEUNIS
Dr. Julien DELVA

BG - Bulgaria
Dr. Dimiter SYRAKOV
Dr. Ivan NEDKOV

CH - Switzerland
Dr. Danick BRIAND
Dr. Marco BRINI
Dr. Christine ALEPEE
Dr. Nicolas MOSER
Dr. Christoph HUEGLIN

CZ - Czech Republic
Dr. Vera KURKOVA

DE - Germany
Dr. Thomas A. J. KUHLBUSCH
Dr. Ulrich QUASS
Prof. Andreas SCHUETZE
Dr. Tilman SAUERWALD
Prof. Ralf MOOS
Dr. Daniela SCHONAUER-KAMIN
Dr. Thorsten WAGNER
Dr. Olaf KIESEWETTER
Dr. Thorsten CONRAD
Dr. Thomas BECKER

DK - Denmark
Prof. Ole HERTEL
Dr. Lise Lotte SORENSEN
Prof. Anja BOISEN
Dr. Silvan SCHMID

EL - Greece
Prof. Kostas KARATZAS
Prof. George KIRIAKIDIS
Dr. Christos KOULAMAS
Prof. George PAPADOPOULOS

ES - Spain
Prof. Juan Ramon MORANTE
Dr. Francisco HERNANDEZ
Dr. Xavier QUEROL
Dr. Mar VIANA
Prof. Eduard LLOBET
Dr. Radu IONESCU
Prof. Albert ROMANO
Dr. Juan Daniel PRADES
Dr. Jordi LLOSA

FI - Finland
Prof. Heli JANTUNEN
Prof. Jyrki LAPPALAINEN
Dr. Jari JUUTI
Prof. Kaarle HAMERI
Prof. Jorma KESKINEN

FR - France
Prof. Marcel BOUVET
Prof. Jerome BRUNET
Prof. Alain PAULY
Dr. Jean SUISSE
Dr. Amadou NDYAE

HU - Hungary
Dr. Zita FERENCZI
Dr. Krisztina LABANCZ

IS - Iceland
Dr. Arngrimur THORLACIUS

IL - Israel
Dr. Liad ORTAR

IT - Italy
Dr. Michele PENZA
Dr. Marco ALVISI
Dr. Saverio DE VITO
Dr. Andrea GOLDONI
Dr. Livia TRIZIO
Dr. Annamaria DEMARINIS
Dr. Gianluigi DE GENNARO
Dr. Luigi BARBIERI
Dr. Roberto SIMMARANO
Prof. Giorgio SBERVEGLIERI

LV - Latvia
Prof. Iveta STEINBERGA

NL - Netherlands
Dr. Sywert BRONGERSMA
Dr. Ernie WEIJERS

PL - Poland
Dr. Monika KWOKA
Prof. Stanislaw GAWRONSKI
Prof. Jacek SZUBER

PT - Portugal
Prof. Bernadete RIBEIRO

SE - Sweden
Prof. Anita LLOYD SPETZ
Dr. Marina VOINOVA
Dr. Mike ANDERSSON
Dr. Ruth PEARCE
Dr. Ulf THOLE
Prof. Ingrid BRYNTSE

SI - Slovenia
Prof. Rahela ZABKAR
Dr. Grisa MOCNIK
Prof. Andrej DOBNIKAR

UK - United Kingdom
Prof. Julian GARDNER
Prof. Roderic JONES
Prof. Krishna PERSAUD
Prof. John POLAK
Dr. Robin NORTH
Dr. Jeff NEASHAM
Dr. Fabio GALATIOTO
Prof. Florin UDREA
Dr. John SAFFELL

NO - Norway
Dr. Nuria Castell-BALAGUER
Dr. Philippe SCHNEIDER

RO - Romania
Dr. Roxana Mioara PITICESCU
Dr. Marcel IONICA
Dr. Cristina RUSTI
Dr. Radu Adrian IONICA

TR - Turkey
Prof. Zafer Ziya OZTURK

AU - Australia
* Dr. Phil MARTIN

CA - Canada
Prof. John YEOW

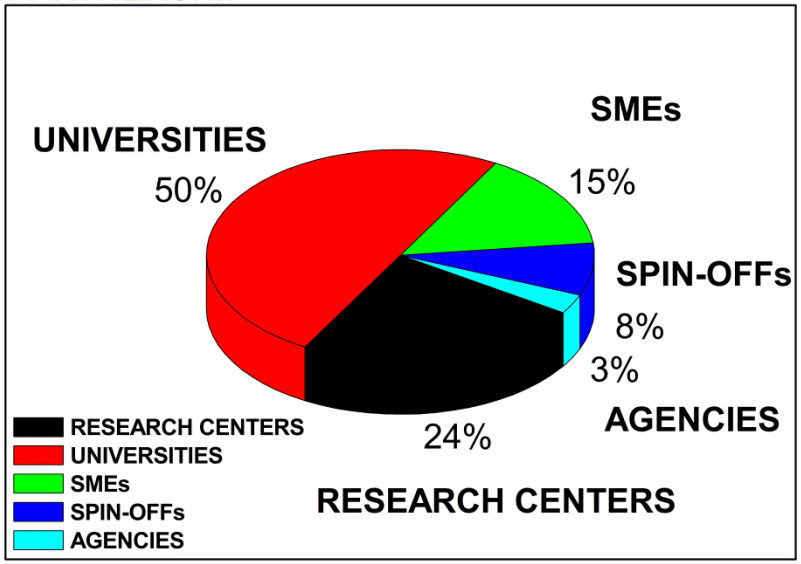
CN - China
Dr. Yongxiang LI
Dr. Zhifu LIU

RU - Russian Federation
Dr. Alexey VASILIEV

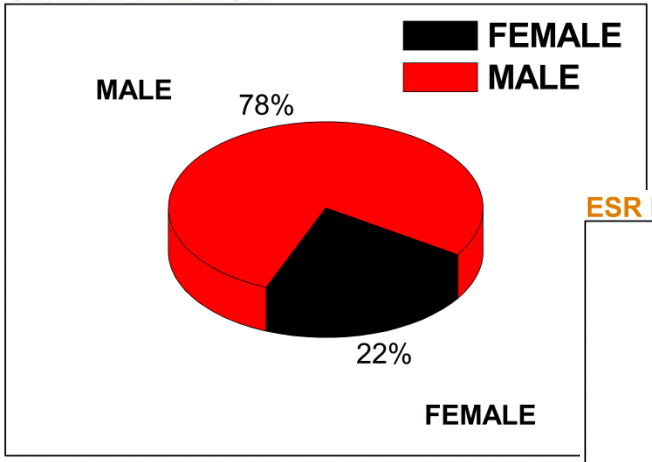
US - United States
Prof. Andrei KOLMAKOV
Dr. Meyya MEYYAPPAN

COST Action EuNetAir: STATISTICS

PARTNERSHIP



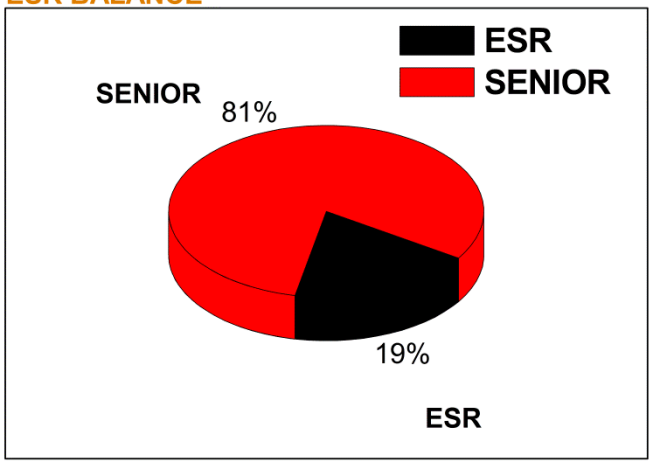
GENDER BALANCE



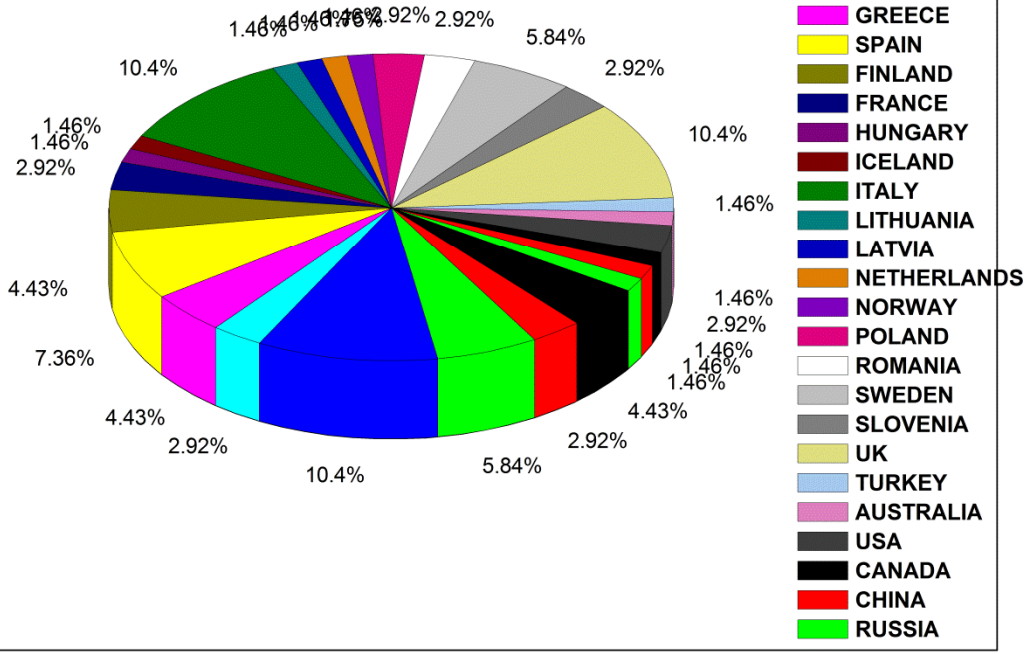
European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir

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

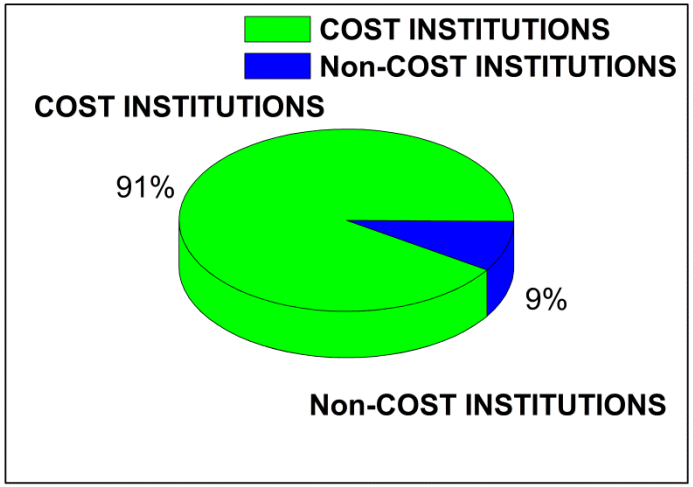
ESR BALANCE



COUNTRY PARTNER DISTRIBUTION BALANCE



INTERNATIONAL BALANCE



ACTION TD1105 EuNetAir MANAGEMENT COMMITTEE

COST Countries that signed MoU: 24 (Sept. 2012)

Country	MC Members (42): *Male (71%) - Female (29%)*
Belgium	Dr Jan THEUNIS; Dr Anne-Claude ROMAIN
Bulgaria	Dr Dimiter SYRAKOV; Dr Ivan NEDKOV
Czech Republic	Dr. Vera KURKOVA
Denmark	Prof. Ole HERTEL
Finland	Prof. Kaarle HAMERI; Prof. Jyrki LAPPALAINEN
France	Prof. Marcel BOUVET; Prof. Jerome BRUNET
Germany	Prof. Andreas SCHUETZE; Dr Thorsten CONRAD
Greece	Prof. George PAPADOPOULOS; Prof. Kostas KARATZAS
Hungary	Ms Krisztina LABANCZ; Dr Zita FERENCZI
Iceland	Dr Arngrimur THORLACIUS
Israel	Dr. Liad ORTAR
Italy	Dr Michele PENZA; Prof. G. SBERVEGLIERI; Dr. G. DE GENNARO
Latvia	Dr Iveta STEINBERGA
Netherlands	Dr Sywert BRONGERSMA; Dr. Ernie WEIJERS
Norway	Dr Nuria CASTELL BALAGUER; Dr. Philipp SCHENEIDER
Poland	Dr Monika KWOKA; Prof. Janislaw GAWRONSKI
Portugal	Prof. Bernadete RIBEIRO
Romania	Dr Marcel IONICA; Dr Roxana Mioara PITICESCU
Slovenia	Dr Grisa MOCNIK; Dr Rahela ZABKAR
Spain	Prof. Juan Ramon MORANTE; Prof. Eduard LLOBET VALERO
Sweden	Prof. Anita LLOYD SPETZ; Prof. Ingrid BRYNTSE
Switzerland	Dr Danick BRIAND; Dr. Nicolas MOSER
United Kingdom	Dr John SAFFELL; Prof. Roderic JONES
Turkey	Prof. Zafer ZIYA OZTURK

MC Chair:	Michele Penza, ENEA, IT
MC Vice Chair:	Anita Lloyd Spetz, Linkoping University, SE
Grant Holder:	University of Bari, IT

Kick-off Meeting on 16 May 2012 at Brussels

Country	MC Substitutes (23)
Belgium	Dr Julien DELVA
Denmark	Dr. Lise Lotte SORENSEN
Finland	Prof. Jorma KESKINEN
France	Dr Jean SUISSE Prof. Alain PAULY
Germany	Dr. Daniela SCHONAUER-KAMIN Dr. Thomas KUHLBUSCH
Greece	Prof. George KIRIKIADIS
Italy	Dr. Roberto SIMMARANO Dr. Marco ALVISI Dr. Saverio DE VITO
Poland	Prof. Jacek SZUBER
Romania	Dr. Cristina RUSTI Dr. Marcel Adrian IONICA
Slovenia	Prof. Andrej DOBNIKAR
Spain	Prof. Albert ROMANO-RODRIGUEZ Dr. Jordi LLOSA
Sweden	Dr Ulf THOLE Dr. Marina VOINOVA
Switzerland	Dr Christoph HUEGLIN
UK	Prof. Julian GARDNER Dr Robin NORTH Prof. Florin UDREA

ELIGIBLE PARTICIPANTS

- **MANAGEMENT COMMITTEE MEMBERS**

Each Country participating in an Action can nominate up to 2 MC Members (in addition to the MC Chair) and up to 2 MC Substitutes (Deputies). Members are nominated by COST National Coordinator (CNC).
In Italy, CNC is MIUR - Ministry of Education, University and Research.

- **WORKING GROUP (WG) MEMBERS and NEW PARTICIPANTS (Rules)**

The Working Groups usually consist of a small number of researchers selected by the MC or by a procedure decided by the MC.
WG members may be MC members or other researchers from a participating Country contributing to the achievement of the objectives of the Action, under balance of COST Countries, that have signed MoU.
*As a general rule, 2 Experts per participating Country could be included in a Working Group. **More flexibility** could be explored to enlarge partnership in a WG coming from the same COST Country, that signed Memorandum of Understanding (MoU).*

- ***KICK-OFF MEETING of COST Action TD1105 at Brussels on 16 May 2012.***

Visit Link of COST Action TD1105 EuNetAir:
http://www.cost.eu/domains_actions/essem/Actions/TD1105?

COST ACTION TD1105 MANAGEMENT COMMITTEE

KICK-OFF MEETING of COST Action TD1105 at Brussels on 16 May 2012.

ACTION DISSEMINATION EVENT: IMCS 2012, Nuremberg

IMCS 2012
The 14th International Meeting on Chemical Sensors
May 20 - 23, 2012, Nürnberg/Nuremberg

Special Session: **Chemical Sensors and New Technologies for Air-Pollution Control**

COST Action TD1105 EuNetAir

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

IMCS 2012 - The 14th International Meeting on Chemical Sensors
May 20-23, 2012 - Nuremberg, Germany

Tuesday 22 May 2012
10.30 - 12.30

SPECIAL SESSION PROGRAM
Session Chair(s): Prof. G. Sberveglieri and Dr. Michele Penza

PART I: Sensor Materials and Techniques

Speaker 1: Dr. Michele Penza, ENEA, IT - Action Coordinator
Speaker 2: Prof. Juan Ramon Morante, IREC, ES
Speaker 3: Prof. Eduard Llobet, University Roviri I Virgili, ES
Speaker 4: Dr. Daniela Schonauer-Kamin, University of Bayreuth, DE
Speaker 5: Dr. Andrea Ponzoni, SENSOR Lab. CNR-IDASC, Brescia, IT
Speaker 6: Dr. Danick Briand, EPFL, CH

Wednesday 23 May 2012
10.30 - 12.30

SPECIAL SESSION PROGRAM
Session Chair(s): Prof. G. Sberveglieri and Dr. Michele Penza

PART II: Sensor-Systems, Technologies and Applications

Speaker 7: Prof. Andreas Schutze, Saarland University, DE
Speaker 8: Prof. Anita Lloyd Spetz, Linkoping University, SE
Speaker 9: Dr. Sywert Brongersma, IMEC-Holst Centre, NL
Speaker 10: Prof. Rod Jones, University of Cambridge, UK
Speaker 11: Dr. Saverio De Vito, ENEA, IT
Speaker 12: Prof. Julian W. Gardner, University of Warwick, UK

ACTION DISSEMINATION EVENT: SGS 2012, Cracow (PL)

SPECIAL SESSION PROGRAM

Session Chair(s): Prof. Eduard Llobet (MC Member) and Dr. Michele Penza (Action Chair)

Nanostructures & Sensing Technologies for Environmental Gas Sensors

Half-a-Day Session at one day during Conference on 11-15 September 2012
Friday 14 September 2012

Talk 1: 30 minutes (14.00 - 14.30)
Tentative Title: *Overview of COST Action TD1105 EuNetAir*
Speaker: Dr. Michele Penza, ENEA, IT - michele.penza@enea.it

Talk 2: 30 minutes (14.30 - 15.00)
Tentative Title: *Nanowires for low power consumption gas sensors*
Speaker: Dr. J. Daniel Prades, University of Barcelona, ES - dprades@el.ub.es

Talk 3: 30 minutes (15.00 - 15.30)
Tentative Title: *Carbon nanotubes-based gas sensors for pollutants: Elaboration methods for NO2 and BT detection*
Speaker: Dr. Amadou L. Ndiaye, LASMEA, Aubiere, France - amalat2005@yahoo.fr

Talk 4: 30 minutes (15.30 - 16.00)
Tentative Title: *TiO_2 Nanotubes Based Heterostructures For Gas Sensing Applications*
Speaker: Prof. Zafer Ziya Ozturk, GEBZE Institute of Technology, Kocaeli, Turkey - zozturk@gyte.edu.tr

Talk 5: 30 minutes (16.00 - 16.30)
Tentative Title: *Array of Polycyclic Aromatic Hydrocarbons and Carbon Nanotubes for Accurate and Predictive Detection of Volatile Organic Compounds under Real-World Environmental Humidity Conditions*
Speaker: Dr. Radu Ionescu, TECHNION, Haifa, Israel; and University Roviri I Virgili, Tarragona, Spain - radu.ionescu@urv.cat

Talk 6: 30 minutes (16.30 - 17.00)
Tentative Title: *Tailoring of WO_3 and V_2O_5 Nanostructures for Gas Sensing Applications*
Speaker: Jyrki Lappalainen, Microelectronics and Materials Physics Laboratories, University of Oulu, Finland - jyrki.lappalainen@oulu.fi

SGS 2012
VIII International Workshop on
Semiconductor Gas Sensors
September 11 - 15, 2012, Cracow, Poland

ACTION DISSEMINATION EVENT: ISQL 2012, Halkidiki (EL)

3th Intelligent Systems for Quality of Life information Services Workshop (ISQL 2012)
8th AIAI Conference, September 27- 30, 2012, Halkidiki, Greece

TUTORIAL SESSION PROGRAM

Tutorial Chair(s): Dr. Michele Penza (Action Chair) and Prof. Kostas Karatzas (MC Member)

Environmental Sensors for Air Quality Control Applications

Two-hour Session on 29 September 2012 (Tentatively)

30 minutes (10.00 - 10.30)
Tentative Title: *Overview of COST Action TD1105 EuNetAir*
Speaker: Dr. Michele Penza, ENEA, IT - michele.penza@enea.it (Chair Delegate or MC Member)
CONFIRMED

30 minutes (10.30 - 11.00)
Tentative Title: *New approaches in outdoor air quality monitoring: mobile sensing, participatory sensing and sensor networks*
Speaker: Dr. Jan Theunis, VITO, BE - jan.theunis@vito.be
CONFIRMED

30 minutes (11.00 - 11.30)
Tentative Title: *Applications of sensors for urban air quality monitoring*
Speaker: Dr. Christoph Hueglin, EMPA, CH - christoph.hueglin@empa.ch
CONFIRMED

30 minutes (11.30 - 12.00)
Tentative Title: *Standards for AQC Sensors, creating a more Healthy Environment*
Speaker: Prof. Ingrid Bryntse, SenseAir AB, SE - ingrid.bryntse@senseair.com
CONFIRMED

ACTION DISSEMINATION EVENT: TCM 2012, Crete (EL)

SPECIAL SESSION PROGRAM

Open Satellite Workshop Chair(s): Prof. Giorgio Sberveglieri (MC Member), Prof. Juan Ramon Morante (MC Member) and Dr. Michele Penza (Action Chair)

Materials, Nanostructures and Technologies for Environmental Sensors

Two-and-half-hour Session on 21 October 2012 (Sunday) - Tentatively

Talk 1: 30 minutes (14.00 - 14.30)
Title: *Overview of COST Action TD1105 EuNetAir*
Speaker: Dr. Michele Penza, ENEA, IT - michele.penza@enea.it (
CONFIRMED

Talk 2: 30 minutes (14.30 - 15.00)
Title: *Carbon nanotubes as chemical sensors: true and false stories*
Speaker: Dr. Andrea Goldoni, ELETTRA, Trieste, IT - goldonia@elettra.trieste.it
CONFIRMED

Talk 3: 30 minutes (15.00 - 15.30)
Title: *Localized growth and in situ integration of metal-oxide nanowires for gas-sensin*
Speaker: Prof. Albert Romano-Rodriguez, University of Barcelona, ES - aromano@el.u
CONFIRMED

Talk 4: 30 minutes (15.30 - 16.00)
Title: *Materials advances for ppb gas detection*
Speaker: Dr. John Saffell, Alphasense Ltd, Essex, UK - jrs@alphasense.com
CONFIRMED

Talk 5: 20 minutes (16.00 - 16.30)
Title: *High pressure chemical processes for the development of new nanostructured complex systems*
Speaker: Dr. Cristina Rusti, IMNR, Pantelimon, RO - crusti@imnr.ro
CONFIRMED

TCM 2012
The 4th International Symposium on Transparent Conductive Materials
October 21- 26, 2012, Hersonissos, Crete, Greece

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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

ENEA
ITALIAN NATIONAL AGENCY FOR NEW TECHNOLOGIES, ENERGY AND SUSTAINABLE ECONOMIC DEVELOPMENT

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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST ACTION TD1105 *EuNetAir*

First Meeting of Action Management Committee and Working Groups

ENEA Headquarters, 4-6 December 2012, Rome (IT)

COST ACTION TD1105 *EuNetAir*

Second Meeting of Action Management Committee, Action Workshop and Training School

Transducers-2013, 14-21 June 2013, Barcelona (ES)

Action website: **www.cost.eunetair.it**

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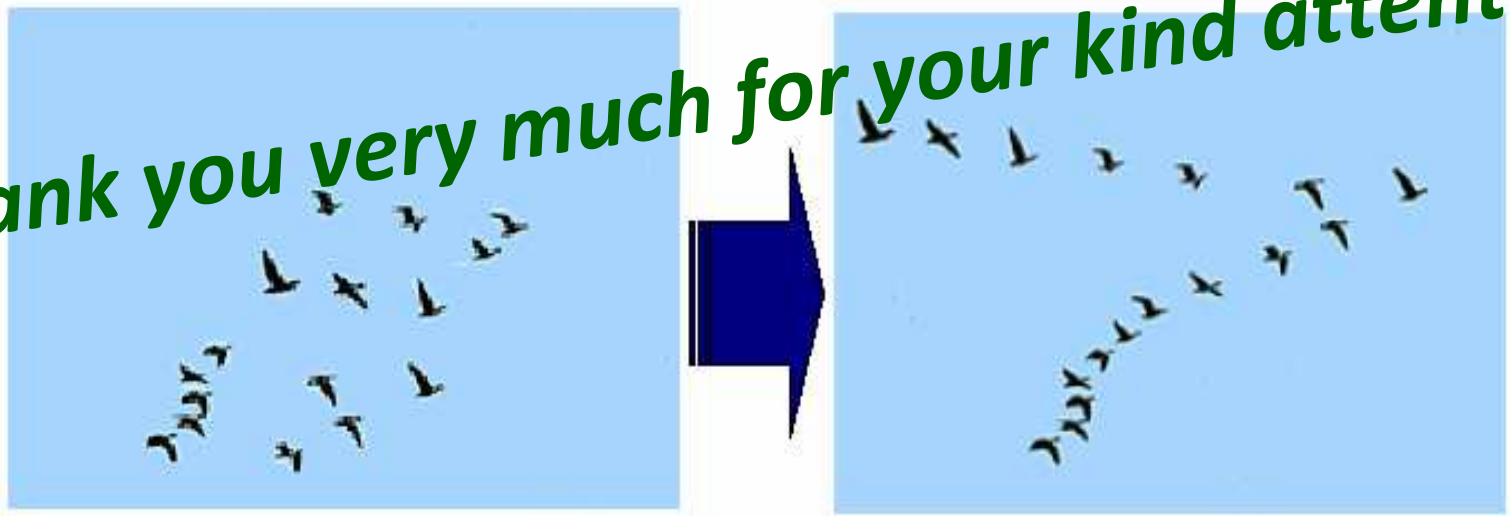
FINAL CONSIDERATIONS

NETWORKING of INTERNATIONAL EXPERTS in a Muldisciplinary Framework of COORDINATED ACTION on AQC RESEARCH with special focus on SMEs for Exploitation of Results to support Green-Economy and Sustainable Development for growth in Europe.

SPIRIT of COST Action *EuNetAir* .....

Thank you very much for your kind attention !



COORDINATED EFFORTS ENHANCE SYSTEM EFFICIENCY !

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

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