EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

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

EuNetAir Newsletter

COST Action TD1105 Iss. 6/Jun 2015

Editorial

Contents

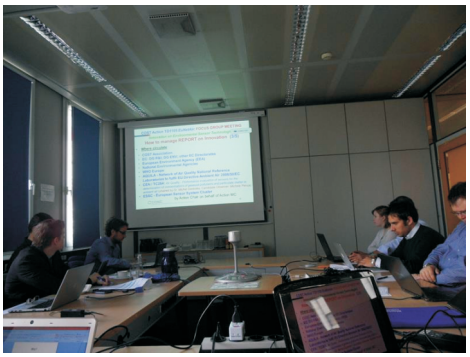
This is already the sixth edition of the "EuNetAir Newsletter", indicating that this COST Action has an over three year-lasting successful history. The first workshop was held as a satellite event during the International Meeting of Chemical Sensors (IMCS) 2012 in Nuremberg. Many workshops followed, on all of them has been reported briefly in the "Newsletter". Also in this volume, some brief reviews on EuNetAir meetings are given, namely on the "3rd Scientific Meeting" in Istanbul (Dec. 2014), on the "3rd International Action Workshop on New Trends and Challenges for Air Quality Control" in Riga (March 2015), on the Focus Group Meeting on "Innovation on Environmental Sensor Technologies" in Munich (April 2015), on the Focus Group on "Aveiro campaign database" in Berlin (April 2015) and on a Training in School in Helsinki (May 2015). More details on the EuNetAir workshops, including planned events, can be found on our website www.eunetair.it.

Another development requires attraction. EuNetAir Action will end in June 2016, i.e., one year remains to continue the EUNetAir success story. What comes next? In our "Focus on" contribution, we report about the European Sensor Systems Cluster (ESSC). This new initiative has been launched in November 2014, with a kick-off meeting in May 2015 in Nuremberg as a satellite event of the Sensor Conference, which is annually held as the scientific part of the Sensor+Test trade fair. Date and location of this kick off meeting are surely not randomly chosen. In fact, it demonstrates the application-oriented objectives of the ESSC which tries to remove commercialization barriers in the field of sensor R&D. I expect ESSC as successful as EuNetAir and invite you to join and contribute to ESSC.

I want to pay tribute to Ms. Dr. Daniela Schönauer-Kamin. Being the manager of the „EuNetAir Newsletter", she does indispensable but often hardly visible editorial work, which includes to correspond with all the contributers of this publication. Thank you.

I hope you enjoy your copy of the sixth edition of the "Newsletter".

Prof. R. Moos, Editor-in-Chief EuNetAir Newsletter,
University of Bayreuth, Germany,
May 2015



Focus On

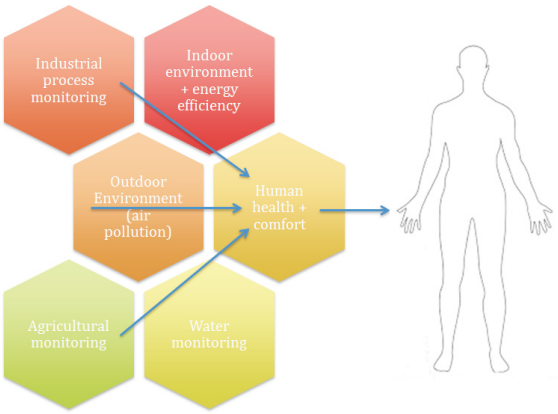
The European Sensor Systems Cluster (ESSC) at the SENSOR+TEST Fair, Nuremberg, Germany, 19 May 2015

M. Penza, Action Chair & ESSC Chairman, ENEA, Italy

A. Schuetze, WG2 Leader & ESSC WG IAQ Leader, Saarland University, Germany

The European Commission launched a new initiative in the field of Research & Innovation with European Clusters to promote international cooperation, create critical mass in Science & Technology and maximize impact in strategic key sectors for European economic growth with high industrial relevance. The **European Sensor Systems Cluster (ESSC)** was launched in Brussels on 27 November 2014 under sponsorship of the DG Research and Innovation, Directorate Key Enabling Technologies - Unit Advanced Materials and Nanotechnologies, with Dr. Hans Hartmann Pedersen (EC Research Programme Officer) as EC Observer. This meeting in Brussels was attended by at least fifteen FP7 and H2020 project coordinators, including Dr. Michele Penza, COST Action TD1105 Chair; Prof. Andreas Schuetze, coordinator of FP7 project SENSIndoor; Dr. Corinna Hahn, Eurice GmbH and COST Action TD1105 Grant Holder, and other representatives from research institutions and SMEs.

ESSC will mobilize a pan-European network, ready to advise, assist and implement national and international measures to strengthen the position of European Research and Innovation.



The **Objectives** of the ESSC are:

- Maximize cooperation between projects (avoid duplication and improve efficiency)
- Identify common interests in on-going research and development (e.g. open calls, training)
- Provide a forum for discussion, problem solving and analytical planning of R&D activities in Europe
- Establish the EU-wide meeting platform for researchers, industry and end-users
- Remove commercialization barriers to ensure EU leadership in sensor technologies
- Integrate inputs and recommendations from other existing clusters or groups
- Promote connection with external bodies
- Disseminate sensor-related issues/findings to stimulate awareness for the invisible environmental problems and to support citizen science

The **ESSC** has been presented at a Kick-off Meeting on 19 May 2015 at Nuremberg Convention Center, NCC West, during AMA Conference 2015 at the **SENSOR+TEST Fair,** Nuremberg (Germany). More info will be available on the upcoming ESSC webpages (www.cluster-essc.eu) including registration for interested parties to join and contribute to ESSC.

Focus On

How indoor air quality can affect children allergies and asthma: The project ARIA

J. Madureira[1], E. de Oliveira Fernandes[1], M. do Carmo Pereira[2], A. Moreira[3], J. P. Teixeira[4]

Considerable interest emerged in recent years on the health effects of indoor air pollution, namely at home and in schools. Yet, determinants associated with the related burden of disease remain poorly known.

The ARIA project ("How indoor air quality can affect children allergies and asthma"), supported by the Fundação para a Ciência e Tecnologia [PTDC/DTP-SAP/1522/2012], is a project aiming at: i)to investigate the impact of indoor environment in schools and homes on children's health and ii) to identify solutions to safeguard the health of children in schools.

The project consisted of a cross-sectional study in 20 public primary schools of children of ages 8-10 during the winter of 2014-2015 based on ISAAC-questionnaires, clinical tests, a building inspection, and indoor air quality (IAQ) measurements; a case-control study in about 100 homes with measurements both in winter (2015) and summer (2015); and an intervention study in three school buildings with more detailed measurements, e.g. active sampling and online monitoring, before and after an intervention related to IAQ.

Twenty public primary schools, 68 homes and almost 1600 children are participating in the ARIA project. The results of the ARIA project will be launched in the Portuguese parliament, stakeholders, and community in general later this year.

[1]Institute of Science and Innovation in Mechanical Engineering and Industrial Management, Portugal; [2]Laboratory for Process Engineering, Environment, Biotechnology and Energy (LEPABE), Portugal; [3]Faculty of Medicine of the University of Porto, Portugal; [4]Environmental Health Department National Institute of Health, Portugal

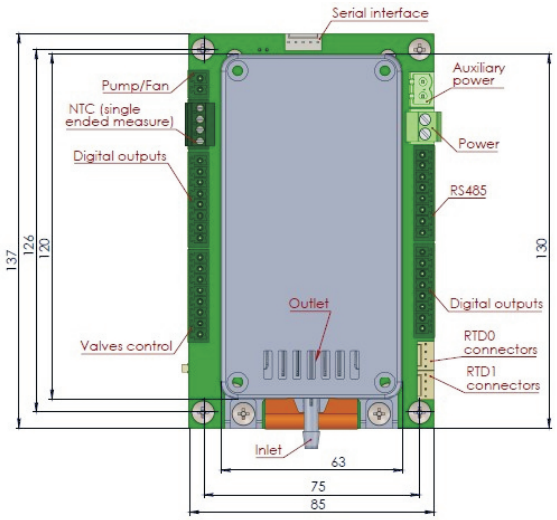
Measurement cuvette for soil evaporation of greenhouse gases

H. Rödjegård, I. Bryntse, SenseAir AB, Sweden

Supported by Fiber Optic Valley in Hudiksvall Sweden, SenseAir has together with InSitu AB developed a sensor cuvette. It could incorporate several different NDIR sensors suitable for advanced greenhouse gas analysis such as CH_4, CO_2, N_2O, and NH_3.

This new sensor chamber has many attractive properties for those that want to measure at demanding outdoor sites around the world. Supporting functions have been developed such as gas pre-treatment, drying, pump units, and generation of zero-gas.

An example of a future sensor module is shown in the figure. The first testing will be made in a test chamber at SLU in Uppsala (Swedish University of Agricultural Sciences), which can produce a flow of greenhouse gases through a soil resembling bed. After this first evaluation, the sensor cuvette station will be placed in "real nature".

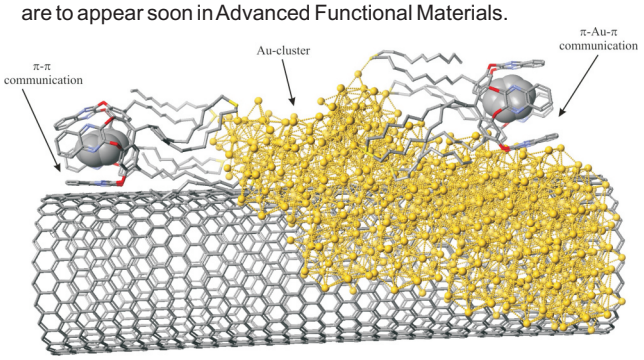


Focus On

Functional nanomaterial for the molecular recognition of benzene

E. Llobet, MC Member, University Rovira i Virgili, Spain

Exposure to benzene vapors, even at trace levels (e.g. between 10 and 100 parts per billion), may eventually result in serious hemotoxic effects in humans. The group of Prof. Llobet (URV) in collaboration with the Institute of Chemical Research of Catalonia has developed a functional nanomaterial for the molecular recognition of benzene in the ambient. It consists of cavitands anchored to gold nanoparticles that decorate the outer wall of multiwalled carbon nanotubes. The cavitand is a quinoxaline bridged resorcin arene, which is a container-shaped molecule with a cavity that has a shape and size suitable for hosting a benzene molecule. When a guest molecule from the surrounding chemical environment (e.g. benzene) bounds with the cavitand, the electrical resistivity of the carbon nanotube to which the cavitand is attached changes. By using mats of such nanomaterial deposited onto interdigited electrodes, resistive sensors with unprecedented high sensitivity to benzene have been developed (the limit of detection in the part per trillion level). Sensors are fully reversible at room temperature and show promise for being integrated in hand-held portable analysers, wearable detectors for potential application in environmental monitoring. A patent has been filed and these results are to appear soon in Advanced Functional Materials.



The figure shows the communication between the cavitand (with a benzene molecule host) and the Au-decorated carbon nanotube.

Real scale application of novel photocatalyst in tunnel and monitoring the air with sensor control systems

V. Binas, G. Kiriakidis, MC Member, FORTH, Greece

TCM Group at FORTH currently produces in a semi industrial scale a novel photocatalyst to improve air quality. The amount produced for the specific application in a road tunnel in Crete, Greece, was 80 kg of the final product. It has been shown that the material retained the same structural characteristics and photocatalytic activity as in the lab. The full amount of material synthesized was used for the production of 1000 lt (1 t) of TCM “PhotoCat Tunnel” paint, which consequently was applied in December 2014 in a first real scale application of photocatalytic material in Crete to coat the interior surface of a road tunnel (just outside Stalida in Crete) in the framework of a European project (INTERREG) utilized by the Region of Crete. The total surface area that the TCM “PhotoCat tunnel” was applied on was 4000 m2 as shown in the figure. Gas sensor systems have been installed inside the tunnel to monitor the air quality in the tunnel for one year.

Fig. 8. The first real application in tunnel in Crete. Tunnel in Stalida.

Modelling the response of acoustic piezo-electric resonators in biosensor applications

M.Voinova, Chalmers University of Technology, Sweden

Acoustic piezoelectric resonators are widely used as precise analytical chemistry tools for the real-time monitoring of a negligibly small amount of surface-attached mass of biological components, in particular, in environmental biosensor measurements. The surface acoustic wave (SAW)-based sensors and the quartz crystal microbalance (QCM) compared in our work belong to the leading group due to their considerable advantages. These piezoelectric resonators are considered now as high-resolution analytical tools allowing researchers to discriminate between components due to the selective polymer coating on the resonator surface. The gravimetrical measurements performed with the SAW-based or QCM sensors provide the experimental data with high precision for the detection of surface mass for the thin adsorbed layer rigidly attached to the oscillator surface. The new challenge is the analysis of soft and biological materials, where the viscous losses of energy can essentially influence measured characteristics. Modelling is the important part of the analysis allowing researchers to quantify the results of the experiments. The present work provides a general theory of SH-SAW devices probing soft and biological materials. The results are compared with QCM-D operated in liquid media

(M. Voinova, Modelling of the response of acoustic piezoelectric resonators in biosensor applications – Part 1: The general theoretical analysis, J. Sens. Sens. Syst. 4 (2015) 137-142)

News from Special Interest Groups

SIG 1 - Network of spin-offs

Focus Group "Innovation on Environmental Sensor Technologies"

Marco Alvisi, MC Member & SIG1 leader, ENEA, Italy

Coming from the awareness that the EuNetAir community is composed from an interdisciplinary and very representative number of excellent partners, during the last meeting in Istanbul, the idea of define a vision on the topic of Innovation on Environmental Sensor Technologies, to collect all the knowledge shared during the Action workshop and meetings and to finalise it in an Action report, took place.

The report on Innovation on Environmental Sensor Technologies is a facultative and ambitious instrument to assess the key factors in sensor technology and the relative state of the art in an effective and exhaustive way; to depict, as an excellence and comprehensive community, a collective vision in order to define a roadmap of suggested actions; to map existing approaches and methodologies and propose new ones and to map the strengthness and weakness factors of the European technology in sensors for AQC. The focus group method has been assumed as methodology, based on interdisciplinary panel of experts who will coordinate the redaction of the report, but during the Linköping workshop, in SIG1 session, other innovative methodologies useful to assess the state of the art of the sensor technology in AQC will be presented.

The report will take in to account all the different point of view (from academy, research, industry and agency) on the topics (materials, sensors, data process, protocols) of the EuNetAir Cost Action for Outdoor and Indoor Air Quality Monitoring.

News from Ad-Hoc Groups

Short Term Scientific Missions (STSMs)

J. Theunis, MC member & STSM coordinator, VITO, Belgium

A third Call for Short Term Scientific Missions (STSMs) was launched in June 2014 to give opportunity to young researchers, PhD-students, or graduated early-scientists to apply for scientific missions in host laboratories of Action partners in MoU-signed COST countries. Since the last newsletter seven more STSM have been granted. This newsletters briefly reports on four of them.

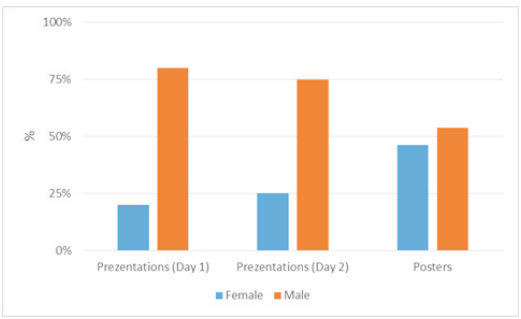
- Onur Alev, Fabrication of one dimensional TiO_2-nanostructures modified with organic materials for device applications
- Paul Smith, Investigation of SenseAir´s LPL (Long Path Length) platform iBASS for precise gas measurements
- Ana Cvitesic, Physical-chemical characterization of the water soluble fraction of the marine aerosols
- Joris Van den Bossche, Mobile monitoring for mapping real-time urban air quality
- Dusan Topalovic, Training in data fusion and data assimilation techniques to monitor air quality
- Milos Davidovic, Training in observational platforms for monitoring air quality including uncertainty
- Marius Rodner, Training on PLD techniques for WO_3 processing to be applied as gas sensor material

A new call for applications for the 4th year will be launched soon. The first deadline for applications will be 1st July 2015, and then again every three months. Applicants are requested not to wait until the final deadline to send in their application. Details of the call for 3th year can be consulted on the EuNetAir website (http://www.eunetair.it/cost/documenti/COST_Action-TD1105_Call-STSM__Year3_V4.pdf). The procedure will be the same for 4th year.

Gender Balance

I. Steinberga, MC member & GB coordinator, University of Latvia, Latvia

During the last (26 – 27 March 2015) international scientific workshop on New Trends and Challenges for Air Quality Control in Riga, 37 % of 55 participants were female, reflecting a positive tendency. Balance of female presenters varies from 20 % to 46 %. A detailed distribution of male and female speakers in the Riga meeting is shown in the figure.



Science & Tech Talk

Science & Tech Talk

News from Croatia: Mobile air-quality sensor design, collocated calibration tests, outdoor deployments

V. Bilas, University of Zagreb, Croatia

University of Zagreb, Faculty of Electrical Engineering and Computing is a new member of the COST Action TD1105 EuNetAir since December 2014. Participating group is the Laboratory for Intelligent Sensors and Systems, (Prof. Vedran Bilas, www.fer.unizg.hr/liss).

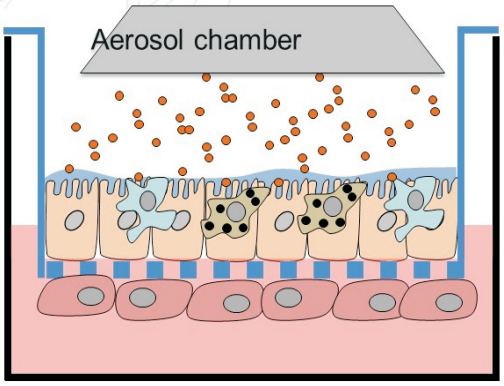
In February the group successfully concluded the EU FP7 project OpenIoT, in collaboration with the team from the Department for Telecommunications (Prof. Ivana Podnar-Žarko). The outcome is the deployed prototype of the air-quality "crowdsensing" system – an infrastructure enabling the citizens' participation in air-quality measurements. The group contributed by designing a wearable air-quality sensor device capable to measure CO, NO_2/SO_2, temperature, humidity, and the pressure, and to communicate wirelessly with smartphones (*Oletic, D., Bilas, V., Design of Sensor Node for Air Quality Crowdsensing, Proceedings of IEEE Sensors Applications Symposium 2015, pp. 346-350*). The response of the sensor was verified by laboratory tests, and by collocated comparisons to gas analyzers in collaboration with the Institute for Medical Research and Occupational Health, an accredited body for air-quality control in Zagreb.

The air-quality crowdsensing system functionality was verified in a number of outdoor tests with up to 20 sensors worn by pedestrians and bicycle riders in Zagreb, Split, Karlsruhe, and Boston. Latest system deployment was from 2nd to 10th April in Singapore at the Jurong District test-site of the Singapore's Smart Nation project. Deployment was organized in a collaboration with the Singapore-MIT Alliance for Research and Technology (Dr. Marguerite Nyhan) under support of Massachusetts Institute of Technology (Prof. Rex Britter, Prof. Carlo Ratti).

News from Luxembourg: 3D-in vitro models in air pollution?

A. Gutleb, LIST, Luxembourg

Within the Environmental Health Group at the Luxembourg Institute of Science and Technology (LIST), complex 3D *in vitro* coculture systems are developed. Such in vitro models are valuable tools to study biological processes in a more realistic way than in the classic monocell and monolayer systems and allow for example direct cell-cell interaction, cell migration, etc. that may affect cellular responses. In combination with modern systems biology approaches, 3D *in vitro* co-culture systems are the next step to further replace *in vivo* experiments in drug development and toxicity studies. The developed cell model consists of human alveolar cells that are cultured at the air-liquid-interface in contact with endothelial cells, macrophages, and mastcells (see Figure) that are all functional. Together with a Vitrocell system such cells can be exposed to particulate matter or chemicals via the air stream. The group envisaged to contribute to the EuNetAir COST Action by providing expertise on biological testing of relevant materials.

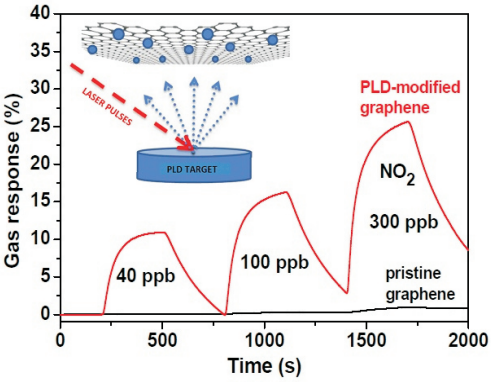


Science & Tech Talk

News from Estonia: Graphene Gas Sensors

R. Jaaniso, University of Tartu, Estonia

Graphene as a single-atomic-layer 2D material has a great potential to create sensitive and low-power gas sensors. However, in order to realise this potential for different polluting gases, graphene has to be functionalized - adsorption centres of different types have to be created at its surface. We have shown that pulsed laser deposition (PLD) is a versatile and precise tool for this purpose. Versatile - as a variety of defects or clusters can be formed on graphene from different atomic species with different "surface landing energies", and precise - as typically only ~1/100th of a monolayer or less is deposited by a single laser pulse. Our studies have shown that the gas response can be significantly enhanced and recovery times significantly shortened by choosing the right PLD target material (e.g. in case of conductometric response to NO_2 gas (as shown in the figure) the target material was ZrO_2) and deposition conditions. The project is supported by Graphene Flagship and Estonian Science Agency.



News from Spain: FP7 project MOSSclone

A. Fernandez, University Santiago de Compostela, Spain

Air pollution biomonitoring by means of terrestrial mosses allows designing dense sampling grids and the simultaneous measurement of different types of contaminants (e.g. heavy metals, PAHs, etc.). In urban environments where native mosses may be scarce or even absent, the moss transplant technique ("moss-bags") has been developed to monitor airborne pollutants. The moss-bags usually are made from mosses collected from pristine areas -a fact that could affect the viability of natural populations-, therefore the material used for the bags is affected by natural variability and by its availability. Nevertheless recently, thanks to the work carried out under the FP7 project MOSSclone, the technique has been improved by: i) isolating a clone of a moss species that now is cultured in laboratory conditions; ii) the design of an innovative device for exposing the clone; and iii) the optimization and standardization of the exposure methodology for these new devices.

Science & Tech Talk: STSM reports

STSM reports

Fabrication and Gas Measurements of 1-D TiO_2 Nanostructures Modified with Organic Materials for Gas Sensing Applications

O. Alev, Gebze Technical University, Turkey

I am a Master student at Gebze Technical University in Turkey. My research topic is focused on "Fabrication of one dimensional TiO_2 nanostructures modified with organic materials for device applications". The Cost Action EuNetAir presented to me a great opportunity to gain experience in the Sensor Laboratory of the University of Brescia, Italy. During my STSM stay in Brescia, I was welcomed by Prof. Elisabetta Comini and her team.

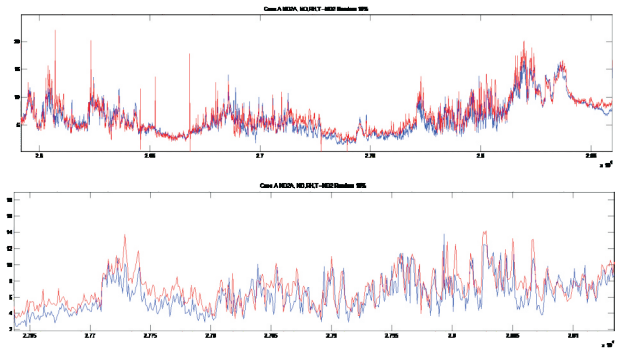
The Sensor Laboratory has a long experience in the field of metal oxide based gas sensors, thus I gained new approaches about my field (magnetron sputtering, gas measurement system, growth technics etc.). Also, this STSM opens special collaborative work between both laboratories.

Science & Tech Talk: STSM reports

Computational Intelligence for Multisensing Device Calibration

S. De Vito, ENEA, Italy

The objective of my STSM was to apply dynamic computational intelligence techniques to calibrate chemical multisensory devices deployed on the field. On field multivariate calibration of chemical multisensory device is emerging as a premium technique capable to set the standard for achieving best overall performance in terms of precision and accuracy. Actually, the use of computational intelligence techniques allows for pursuing a data driven approach that, by joining together information coming from all the components of the sensor array, permit to reduce specificity and stability issues of our transducers. During the mission, dynamic neural networks and SVM have been used to develop regression models using data coming from high sampling frequency SNAQ multisensors deployed in Cambridge by CAS (Centre for Atmospheric Science, University of Cambridge). Such data have allowed to investigate the properties and the capabilities of these models



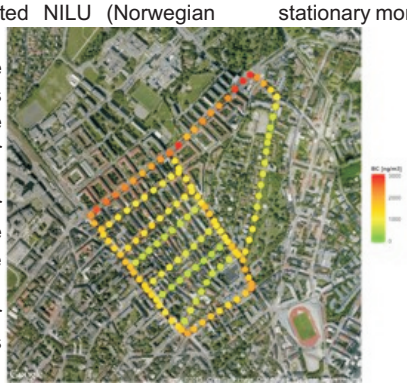
in a very stimulating and supporting environment like the R.L. Jones group at CAS.

The figure presents timeline segments depicting the multisensory calibrated output (red) and the NO_2 reference gas concentration (ppbs) for the NO_2 targeted experiment (blue). Although slightly overestimating the concentration, the intelligent microsensor device is capable to accurately follow the reference signal fluctuations at low ppb levels.

Mobile monitoring for mapping real-time urban air quality

J. van den Bossche, VITO and Ghent University, Belgium

During my STSM, I visited NILU (Norwegian Institute for Air Research), near Oslo, Norway. The objective of the STSM was to validate mobile monitoring methods for mapping urban air quality, which I developed for Antwerp. Furthermore, the results of the mobile monitoring campaign could be compared to other available data sources (different sensors, stationary monitor, model output). The potential to develop (real time) city-wide air quality maps based on mobile monitoring data was also discussed.

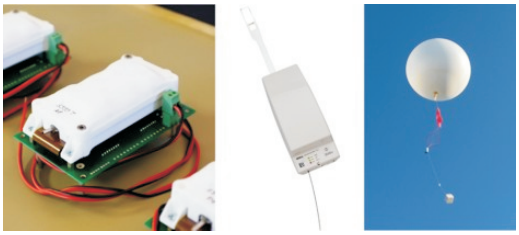


Together with NILU researchers and volunteers, we conducted a mobile monitoring campaign in the Majorstuen neighbourhood in Oslo in the first week of my stay. Some first results for the Black Carbon concentrations (measured with the micro-aethalometer) are shown on the figure, and indicate a strong spatial variability. We also measured PM2.5 and PM10 with a DustTrak. These pollutants show a similar spatial variability. These data confirm that mobile monitoring is an interesting method to assess the spatial variation in air pollutant concentration levels.

Investigation of SenseAir´s LPL platform iBASS

P. Smith, University of Cambridge, UK

I completed a two-week STSM with SenseAir, Delsbo, Sweden. The purpose was to help build and characterise prototype CO_2 sensors adapted from SenseAir's exisiting Alkolock (iBASS) technology, which utilises a miniature long-path length NDIR platform to give fast response and greater sensitivity to CO_2 compared to existing methods.



My research project at Cambridge University is to integrate this sensor into a package suitable for use with weather balloons. The sensor, therefore, needs to be able to withstand extreme temperatures and pressures. It has to be inexpensive and should consume only low power. I am working in partnership with SenseAir to find solutions for that.

The STSM with SenseAir has been a very positive experience. I can now appreciate the issues faced by SME's in developing sensors. After presenting my research to the developers at SenseAir, they understood what we are doing. I look forward to continuing our collaboration.

The figure shows from left to right: SenseAir prototype CO_2 LPL instrument, Vaisala RS41 radiosonde, weather balloon after launch. © SenseAir, Vaisala, radiosondemuseum.org

Events & Announcements

Overview on EuNetAir Events

Summary of 3rd Scientific Meeting in Istanbul

Z. Z. Öztürk, Local Organizer, Gebze Technical University, Turkey

A. Güngör, Local Organizer, Bahçeşehir University, Turkey

The 3rd Scientific Meeting entitled "New Sensing Technologies for Indoor Air Pollution Monitoring", Working Group and Management Committee, organized by Gebze Technical University and Bahçeşehir University, 3-5 December 2014, was an unprecedented event in COST Action. 61 participants from 22 countries attended the Working Group Meeting on 3 and 4 December 2014 and 34 persons the Management Committee Meeting on 5 December 2014.

The main objective was to give an opportunity to exchange ideas, results, etc. for researchers and engineers working on the development of new sensing technologies for air quality control at integrated and multidisciplinary scale by coordinated research on nanomaterials, sensor-systems, air quality modelling and, standardisation methods for supporting environmental sustainability with a special focus on small and medium enterprises.

The Meeting has included two plenary sessions, WG1-WG2 and WG3-WG4 parallel sessions, keynote session, SIG1, SIG2, SIG3 and SIG4 sessions, IEQ cluster cession, poster session and round table discussion, WGs general assembly SIGs general assembly, live video chat-nanoFIS conference in Graz –Austria, management committee meeting and coffee breaks, lunches, and a social dinner on a boat cruising the Bosporus.

Summary of 3rd International Action Workshop on New Trends and Challenges for Air Quality Control in Riga

I. Steinberga, Chair of the Local Organizing Committee, University of Latvia, Latvia

The 3rd EuNetAir workshop, organized in Riga, Latvia, from 26 – 27 March 2015, focussed on topics concerning new trends and challenges for air quality control. The workshop was organized by the University of Latvia, Faculty of Geography and Earth Sciences in cooperation with the Riga Technical University, Institute of Technical Physics.

Both are leading institutions in science and higher education in Latvia.

The workshop was well attended with totally 49 delegates from 17 countries: Belgium, Bulgaria, Czech Republic, Croatia, Estonia, Germany, Greece, France, Hungary, Italy, Latvia, Norway, Poland, Portugal, Serbia, Spain, United Kingdom. Presentations were given from invited speakers, experts, young researchers, scientists, practitioners and stakeholders. The two-days meeting included prolonged 24 oral presentations, 13 poster flash short presentations and at the end of meeting a live video chat Brussels-Riga which was held with COST Officer Hans Hartman Pedersen about policy inputs from DG Research and Innovation on EU Cluster Sensor-Systems.

During the workshop following topics were discussed:

- health effects of air pollution;
- environmental informatics (data pre-processing, analysing) and AQ sensors;
- methods and applications for environmental sustainability;
- modelling and applications for air quality control;
- advanced materials for chemical sensors;
- sensors and systems for air quality control.

Overview on EuNetAir Events

Summary of Training School in Helsinki

K. Hämeri, University of Helsinki, Finland

The training school focusing on atmospheric aerosol physics, measurement, and sampling was organized by the University of Helsinki at the forest field station in Hyytiälä Finland in May 1.-8. The course was led by professor Kaarle Hämeri from the University of Helsinki. Co-teachers were Prof. Alfred Wiedensohler from Tropos, Leipzig and Dr. Jean-Philippe Putaud from JRC, Ispra.

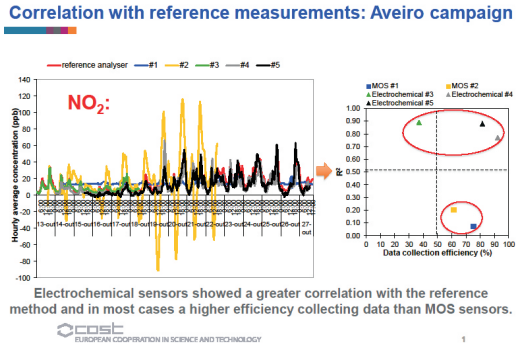
The training school attracted all together 12 students from the COST network from all over Europe and neighbouring countries. During the course, the focus was in understanding the motivation for aerosol studies and fundamental physical and chemical phenomena influencing the aerosol behaviour and fate together with deep understanding of the principles of the measurement techniques.

The training was intensive and involved much collaboration between the attendants. The week passed fast and resulted in new collaboration networks.

Summary of Focus Group Meeting on Aveiro campaign database

K. Karatzas, J. Ginja, S. DeVito and M. Penza

The focus group meeting on data analysis of the Aveiro air quality sensors intercomparison experiment was held on April the 17th, 2015, at the WHO Collaborating Centre for Air Quality Management and Air Pollution Control - Federal Environment Agency in Berlin, Germany. Meeting participants discussed on the goals of the analysis of the data and the methodologies to be used. It was agreed that the first priority should be the finalization of the database, following the guidelines provided by ENEA (Dr. Michele Penza). It was also agreed that the first steps of the data analysis should emphasize on the identification of various types of errors and the harmonization of the data. Publications were also discussed and it was decided that the first publication should describe the experimental set-up and the resulting data, addressing basic correlation and intercomparison issues. Next steps will include further data investigation and modelling tasks.



Summary of Focus Group Meeting on Innovation on Environmental Sensor Technologies

O. Sicard, Siemens AG, Munich

The Focus Group Meeting on “Innovation on Environmental Sensor Technologies” took place on April 29th 2015 in Munich at the site of Siemens Corporate Technology. There were 16 international participants present.

In the beginning, Chairman Michele Penza illustrated the objectives of the focus group. One of the tasks is to present a report on “Innovation on Environmental Sensor Technologies” and to derive future activities and expected impact from it.

The heterogeneous affiliations of the participants (universities, research centers, SMEs, large companies) and the high level of engagement lead to a vivid discussion about the goals of the report and about the expected recipients. As in the past, the EuNetAir COST Action profited from the different backgrounds and resulting viewpoints of the participants.

Several members gave short presentations about present research activities and proposed contents for the report.

Finally a first table of contents for the report was created detailing responsibilities, timelines and proposed length of chapters.

Overview on EuNetAir Events

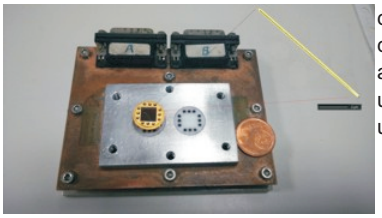
Reports on ISOCS short course in Ponte di Legno

C. Schulte-Albert, Saarland University, Germany

In March 2015, the ISOCS short course was held in Ponte di Legno, surrounded by the Italian Alps. As a young researcher, I received a grant funded by COST Action TD1105. For several months now I have been working on my master thesis which is about the calibration of MOX gas sensors. The course was a great opportunity to gain insight into different kinds of gas sensors, their fabrication and application. Especially food engineering was a big issue at this year's ISOCS short course. Aside from interesting talks, we also had some practical courses in the afternoon during which we could test our new knowledge about pattern recognition and train gas sensors with coffee and other drinks. As a social event the host organized a "ciaspolada", a snowshoe hike. All in all, I had a really great time in Italy and getting to know all the nice people was a valuable experience besides science.

G. Domenech, University of Barcelona, Spain

Indium oxide nanostructures (nanowires, nanorods, nanoneedles, nanooctahedra, ...) have been fabricated via carbothermal reduction using a chemical vapour deposition (CVD) method. Depending on the growth conditions, the different nanostructures are preferentially obtained. These materials were structurally and optically characterised using X-ray diffraction, scanning and transmission electron microscopy and related techniques as well as photoluminescence and Raman spectroscopy, confirming their crystalline nature. To study the sensor properties, the nanomaterials were removed from the substrates applying sonication, followed by the deposition on substrates with pre-patterned electrodes and individual nanomaterials were contacted by focused electron- and ion-beam techniques. The testing of the devices towards different concentrations of gases of interest for environmental applications (NO_2, CO, ...) in synthetic gases has been carried out in a self-made test chamber, at high temperature and at room temperature under the illumination with ultraviolet light.



Announcements

Upcoming Events

EuroNanoforum 2015, June 10-12, 2015, Riga, Latvia. http://euronanoforum2015.eu/

ICEPR'15, 5th International Conference on Environmental Pollution and Remediation, July 15-17, 2014, Barcelona, Spain. http://icepr.org/

IEEE NANO, 15th International Conference on Nanotechnology, July 27-30, 2015, Rome, Italy. http://www.ieeenano15.org/

Eurosensors 2015, 6-9 September 2015, Freiburg, Germany. http://www.eurosensors2015.org/

IEEE Sensors 2015, November 1-4, 2015, BEXCO, Busan, South Korea. http://ieee-sensors2015.org/

ICEPP 2015, 3nd International Conference on Environment Pollution and Prevention, December 5-6, 2015. Dubai, UAE. Abstract submission deadline: 25 July 2015. http://www.icepp.org/

9th International Conference on Sensing Technology (ICST 2015), December 8-10, 2015, Auckland, New Zealand. http://seat.massey.ac.nz/conferences/icst2015/

4th International Conference on Nanostructures, Nanomaterials and Nanoengineering (ICNNN 2015). December 6-8, 2015. Abu Dhabi Polytechnic, UAE. *Paper submission deadline: 01 August 2015.* http://www.icnnn.org/

E-MRS Spring Meeting and Exhibit 2016, May 2-6, 2016, Lille, France; *Symposium by Action: Functional Materials for Environmental Sensors and Energy Systems Applications*. http://www.emrs-strasbourg.com/

Publications of EuNetAir participants

List of publications related to EuNetAir

A. Kumar, J. Brunet, C. Varenne, A. Ndiaye, A. Pauly, M. Penza, M. Alvisi
Tetra-tert-butyl copper phthalocyanine-based QCM sensor fortoluene detection in air at room temperature
Sens. Act. B: Chem. 210 (2015) 398–407

C. Bur
Selectivity Enhancement of Gas Sensitive Field Effect Transistors by Dynamic Operation
Linköping University Electronic Press, 2015;
doi: 10.3384/diss.diva-114670;
ISBN (print): 978-91-7519-119-5

C. Bur, M. Bastuck, D. Puglisi, A. Schütze, A. Lloyd Spetz, M. Andersson
Discrimination and quantification of volatile organic compounds in the ppb-range with gas sensitive SiC-FETs using multivariate statistics
Sens. Act. B: Chem. 214 (2015) 225-233

D. Puglisi, J. Eriksson, C. Bur, A. Schuetze, A. Lloyd Spetz, M. Andersson
Catalytic metal-gate field effect transistors based on SiC for indoor air quality control
J. Sens. Sens. Syst. 4 (2015) 1-8

C. Bur, M. Bastuck, A. Schütze, J. Juuti, A. Lloyd Spetz, M. Andersson
Characterization of ash particles with a micro-heater and gas-sensitive SiC field-effect transistors
J. Sens. Sens. Syst. 3 (2014) 305-313

Z. Darmastuti, C. Bur, N. Lindqvist, M. Andersson, A. Schütze, A. Lloyd Spetz
Hierarchical methods to improve the performance of the SiC-FET as SO2 sensors in flue gas desulphurization systems
Sens. Act. B: Chem. 206 (2015) 609–616

J. Huotari, R. Bjorklund, J. Lappalainen, A. Lloyd Spetz
Nanostructured Mixed Phase Vanadium Oxide Thin Films as Highly Sensitive Ammonia Sensing Material
Procedia Engineering 87 (2014) 1035 – 1038

A. Cvetković, M. Jovašević-Stojanović, D.A. Marković, Z. Ristovski
Concentration and source identification of polycyclic aromatic hydrocarbons in the metropolitan area of Belgrade, Serbia
Atm. Environ. 2105, In Press,doi:10.1016/j.atmosenv.2015.04.034

Dynamic multivariate regression for on-field calibration of high speed air quality chemical multi-sensor systems
S. De Vito, P. Delli Veneri, E. Esposito, M. Salvato, O. Popoola, V. Bright, R.L. Jones
Proceedings of AISEM Annual Conference, 2015 XVIII, pp.1-3, doi: 10.1109/AISEM.2015.7066794

I. Marr, K. Neumann, M. Thelakkat, R. Moos
Undoped and Doped Poly(tetraphenylbenzidine) as Sensitive Material for an Impedimetric Nitrogen Dioxide Gas Dosimeter
Appl. Phys. Lett. 105 (2014) 133301

M.Voinova
Modelling of the response of acoustic piezoelectric resonators in biosensor applications – Part 1: The general theoretical analysis
J. Sens. Sens. Syst. 4 (2015) 137-142

A. M. Eriksson, M. V. Voinova and L. Y. Gorelik
Nonresonant high frequency excitation of mechanical vibrations in a graphene based nanoresonator.
New J. Phys. 17 (2015) 033016

EuNetAir

Newsletter COST Action TD1105 EuNetAir

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