

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

COST Action TD1105

WGs and MC Meeting at LINKÖPING, 3 - 5 June 2015

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

Year 3: 1 July 2014 - 30 June 2015 (*Ongoing Action*)

Summary of R&D needs from WG2 session: Sensors, Devices and Systems for AQC



UNIVERSITÄT
DES
SAARLANDES



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WG2 leader, MC member

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 **cost**
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



Session (WG1) & WG2

16:15 - 16:30 **Low-Temperature Co-Fired Ceramic Package for Lab-on-Chip Application**
Niina Halonen et al., University of Oulu, Oulu, Finland

16:30 - 17:00 **Coffee Break**

Parallel Session of WG1-WG2. Location: Main Hall - Planck Room (Theatre 300 seats)

17:00 - 18:30 **WG2: Sensors, Devices and Systems for AQC**
Chairman: Andreas Schuetze, Action WG2 Chair - Saarland University, Saarbrücken, Germany

17:00 - 17:20 **Functionalised Carbon Nanotube Sensors for Detecting Benzene at Trace Levels**
Eduard Llobet, P. Clement, E.J. Parra, MC Member, Universitat Roviri I Virgili, Tarragona, Spain

17:20 - 17:40 **The Application of Additive Technologies for Ceramic MEMS Gas Sensors**
A.A.Vasiliev¹, A.V.Sokolov¹, N.N.Samotaev², V.P.Kim³, S.V.Tkachev³, S.P.Gubin³, G.N.Potapov⁴, Yu.V.Kokhtina⁴, A.V.Nisan⁴, ¹NRC Kurchatov Institute, Moscow, Russia, ²National Research Nuclear University "MEPhI", Moscow, Russia, ³LLC AkKo Lab, Moscow, Russia, ⁴LLC Ostec, Moscow, Russia

17:40 - 18:00 **Measurement of Monoaromatic Hydrocarbons in Air by Phthalocyanine-based QCM Sensors: Results and Outlooks**
Jerome Brunet, A.Kumar, A.L. Ndiaye, A.Pauly, Université Blaise Pascal/CNRS, Aubiere, France

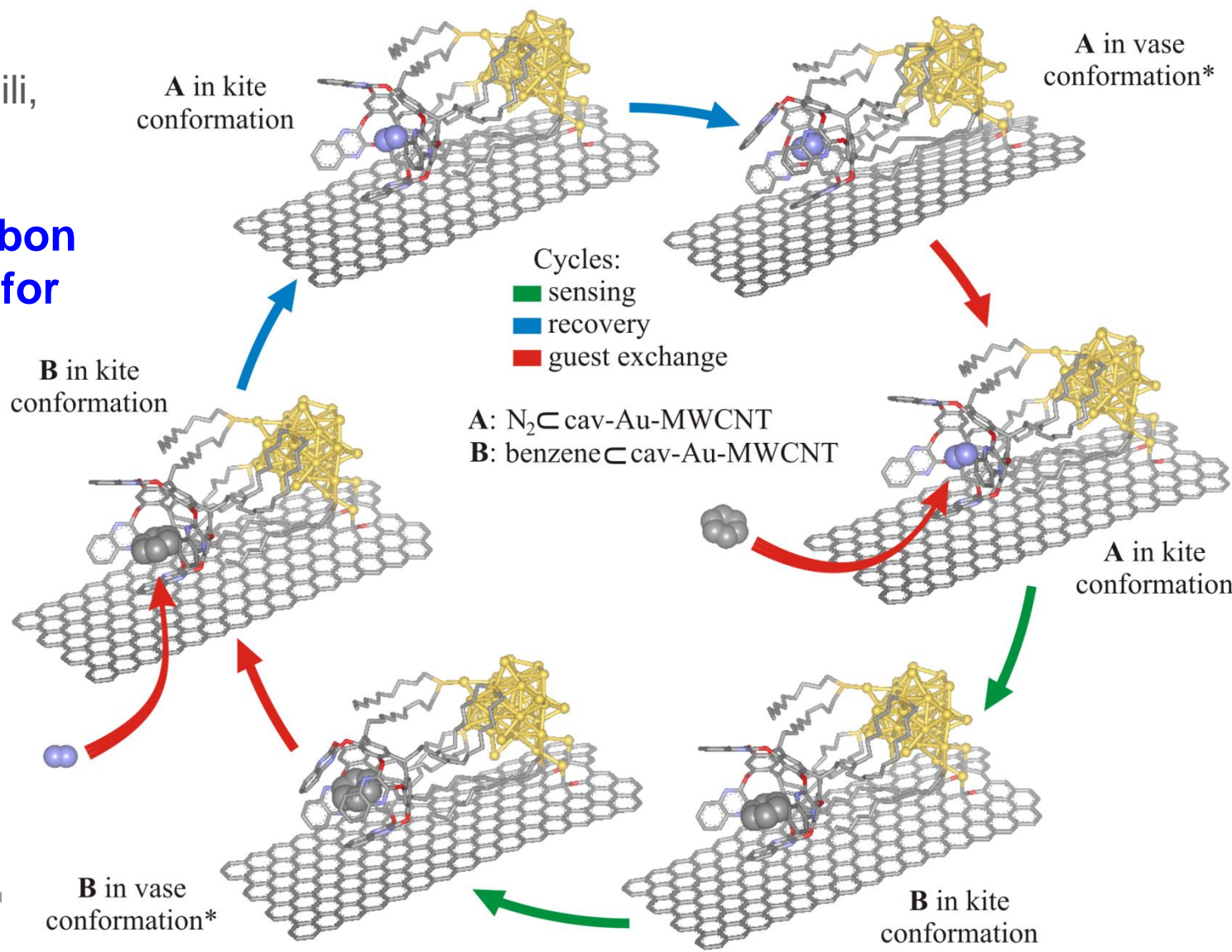
18:00 - 18:15 **New Principle Theory of QCM and SAW Devices in Sensors and Biosensor Applications**
Marina Voinova^{1,2}, Anton Wikstrom², ¹Chalmers University of Technology, Gothenburg, Sweden ²National Technical University, Kharkiv, Ukraine

18:15 - 18:30 **Views on Inter-Laboratory Reproducibility of Chemosensing Experiments**
J.-M. Suisse¹, M. Bouvet¹, K. Persaud², E. Danesh², ¹Institut de Chimie Moléculaire de l'Université de Bourgogne, UMR CNRS, Dijon, France; ²The University of Manchester, UK

Session (WG1) & WG2

Eduard Llobet
Universitat Roviri I Virgili,
Tarragona, Spain

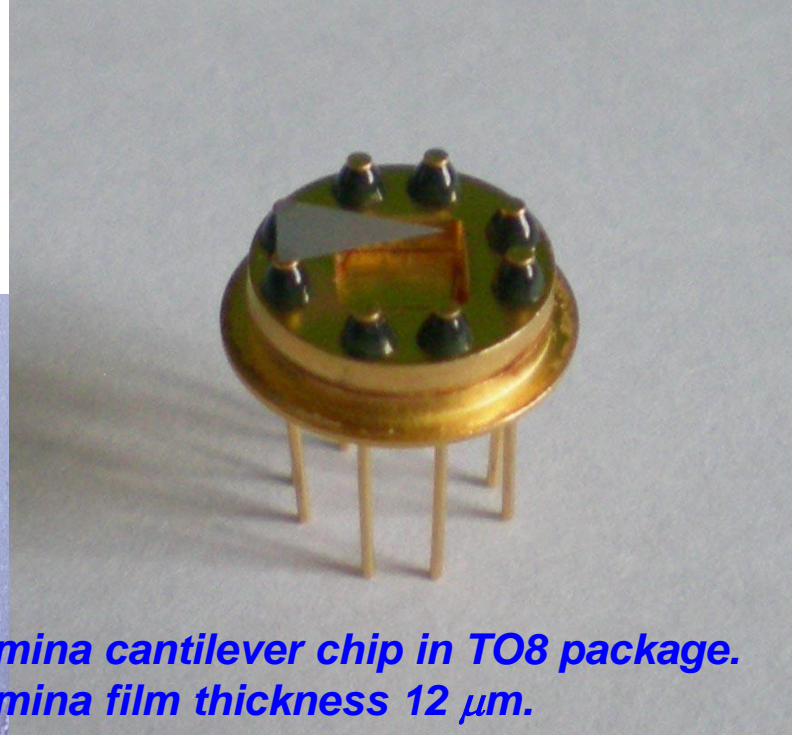
Functionalised Carbon Nanotube Sensors for Detecting Benzene at Trace Levels



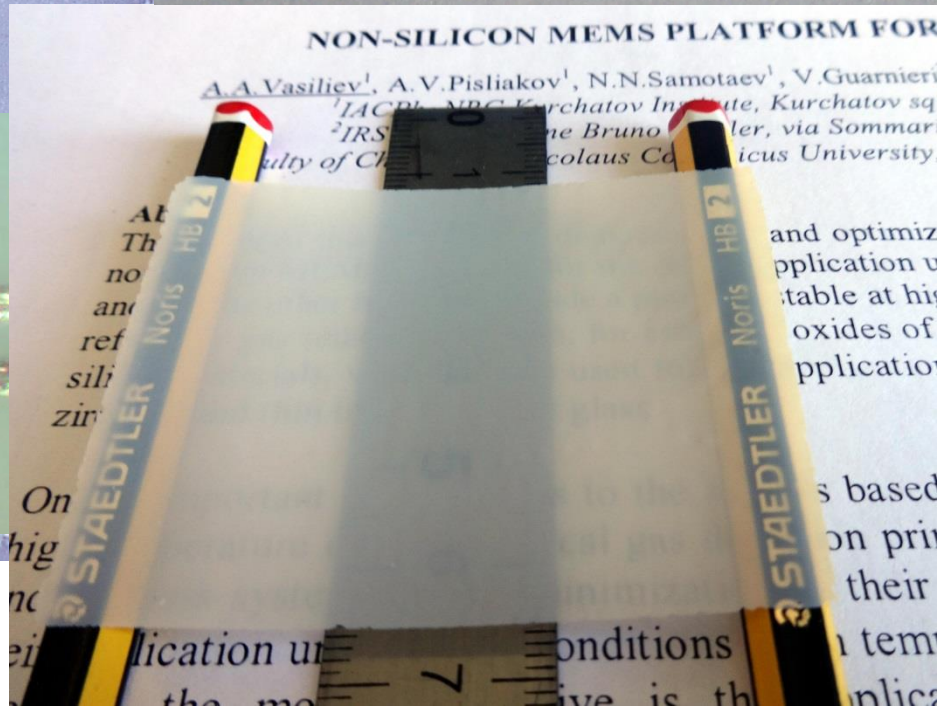
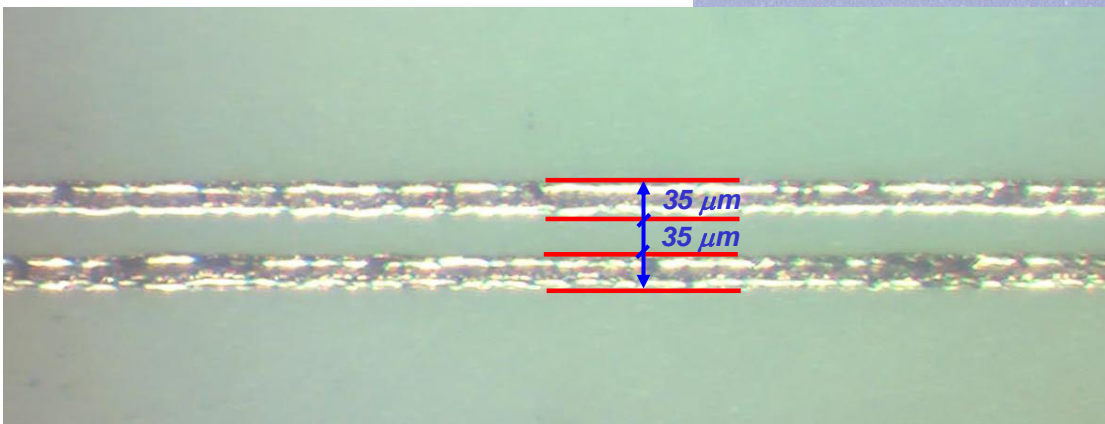
Session (WG1) & WG2

A.A. Vasiliev
NRC Kurchatov Institute,
Moscow, Russia

The Application of Additive Technologies for Ceramic MEMS Gas Sensors



*Alumina cantilever chip in TO8 package.
Alumina film thickness 12 μm .*

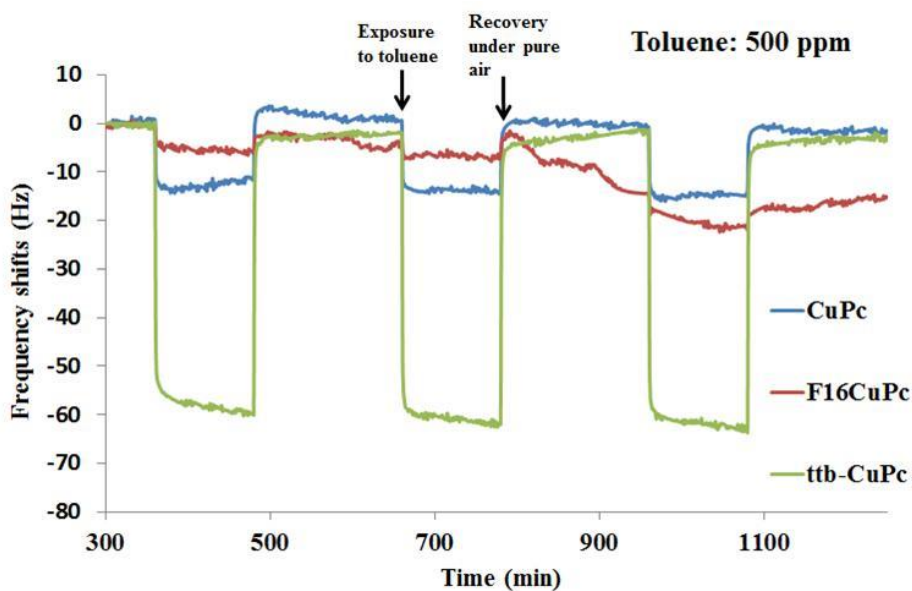
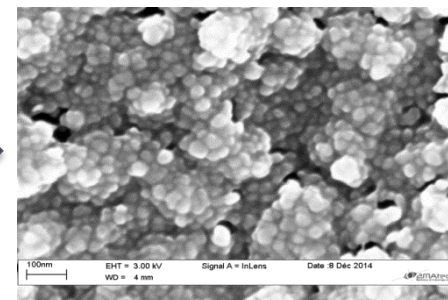
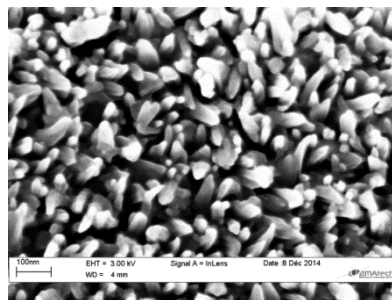
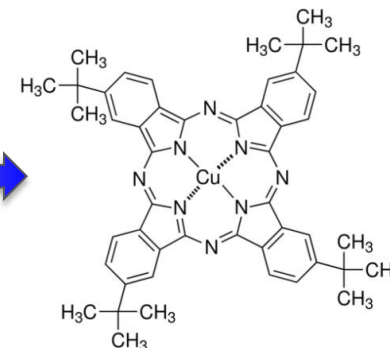
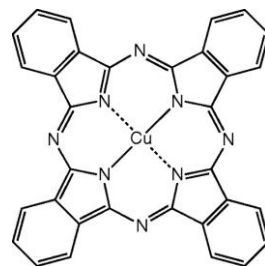


Session (WG1) & WG2

Jerome Brunet

Université Blaise Pascal, Aubiere,
France

Measurement of Monoaromatic Hydrocarbons in Air by Phthalocyanine-based QCM Sensors: Results and Outlooks



Same results with ttb-ZnPc

Strong influence of peripheral groups on gas/material interactions



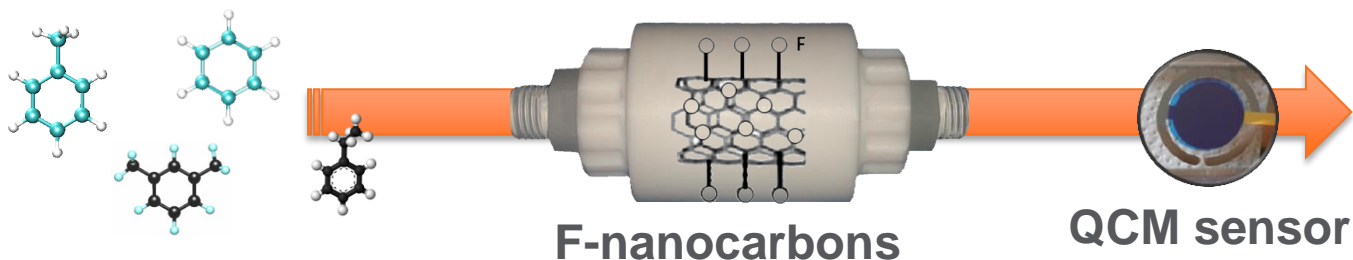
Higher sensitivity to BTX

Session (WG1) & WG2

Jerome Brunet

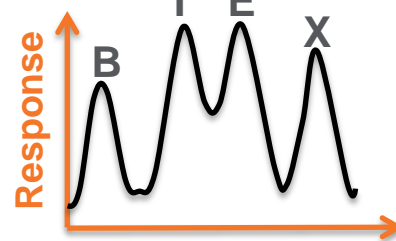
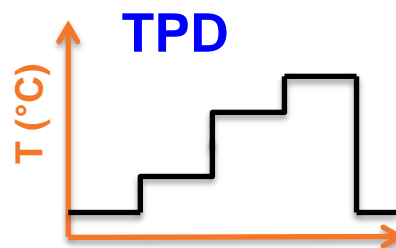
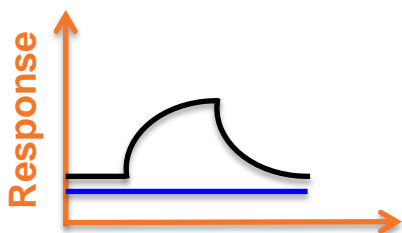
Université Blaise Pascal, Aubiere,
France

ASTHMAA exploratory project
(granted)



Discriminated
responses

Selective filter



Partners:



Session (WG1) & WG2

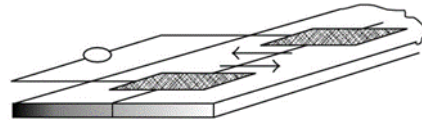
Marina Voinova

Chalmers U. of
Technology, Gothenburg,
Sweden

**New Principle Theory
of QCM and SAW
Devices in Sensors
and Biosensor
Applications**

Modeling SAW:
SH-SSW resonators

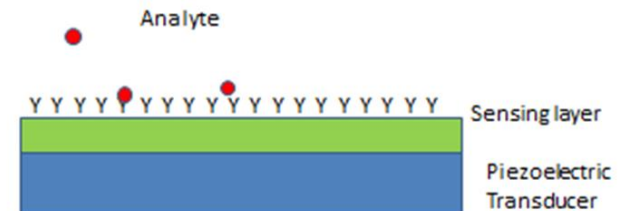
In the air



$$\frac{\Delta V}{V_0} = \frac{1}{2} \frac{\omega^2 \rho_1^2 h^2}{V_0^2 \rho_0^2} \left\{ 1 + \frac{\rho_2}{\rho_1} \right\}^2$$

$$\frac{\Delta V}{V_0} = \frac{1}{2} \frac{\omega^2 \rho_1^2 h^2}{V_0^2 \rho_0^2} \left\{ 1 - \left(\frac{\omega \eta}{\rho V_0^2} \right)^2 \right\}$$

$$\Delta V / V_0 \approx \frac{\omega^2 \rho_1^2 h^2 V_0^2}{2 g_0^2} \left(1 - \frac{\rho_1}{\rho_0} \frac{g_0}{g'} \right)^2$$





Session (WG1) & WG2

J.-M. Suisse

Université de Bourgogne,
Dijon, France

**Views on Inter-
Laboratory
Reproducibility of
Chemosensing
Experiments**

**Compare and verify sensor
response on different test
benches -
You might be surprised!**



Session (WG1) & WG2

Calibration is a research topic for mass production, but first needs to be better understood at lab level, especially for ppb levels

- Interaction between tubing (materials) and gas
- Interaction between flow and sensor
- Flow-through system should be preferred due to reaction products