

Conference Report

Chemical Sensors Forum 2008

Zurich/Uetliberg, September 8–9, 2008

Caspar Demuth* and Jürg Müller

*Correspondence: Dr. C. Demuth, Center for Chemical Sensors, Institute of Biotechnology, Zurich University of Applied Sciences, Grüental, CH-8820 Wädenswil, Tel.: +41 58 934 57 63, E-Mail: caspar.demuth@zhaw.ch

Abstract: More than 60 experts met in the Uto Kulm Hotel on the Uetliberg above Zurich on 8th and 9th September for the Chemical Sensors Forum 2008, an interdisciplinary conference on chemical sensors. The event, organised by the Swiss Chemical Society (Division of Analytical Chemistry) and the Zurich University of Applied Sciences, was devoted to the scientific career of Prof. Ursula E. Spichiger-Keller, who retired from the Swiss Federal Institute of Technology (ETH) Zurich in 2007. Rather than looking back over her successful work at the Centre for Chemical Sensors, the conference focused on new trends in academic and industrial research as well as on applications in the field of chemical sensors, including those influenced by Professor Spichiger's successful work at the Centre for Chemical Sensors.

Keywords: Chemical Sensors · Metrology · Research and applications

The Chemical Sensors Forum 2008

Chemical sensors have been successfully applied to various fields in analytical chemistry, such as clinical chemistry and on-line process control. In many areas, however, users' expectations have not been fully met in spite of substantial investments in research and development by universities and industry. Therefore, an exchange of ideas between researchers and users is essential: the Chemical Sensors Forum 2008 aimed to intensify this dialogue.

Experts from academia and industry presented their views on chemical sensors and analytical chemistry in sessions dedicated to specific topics.

Prof. Ursula E. Spichiger reviews her successful work and engagement in the field of chemical sensors and biosensors.



- Visions and trends in academic research: What are the visions of researchers at universities today that will define the next generation of sensors?
- Trends in industrial R&D: What are the future focal points and key factors for a successful implementation of chemical sensors in process analytics, and medical and laboratory applications from a market viewpoint?
- Metrology: what do we really measure? How can we compare results obtained with chemical sensors with those obtained using conventional methods, and how can we ensure their traceability to reference methods?
- Users' needs: What are the prerequisites for successful applications of chemical sensors? Does academic and industrial research on chemical sensors fulfil the users' requirements?

Visions and Trends from Academic and Industrial Research

In his keynote lecture, Prof. **Anthony P. F. Turner** (Cranfield University) gave an impressive overview of the research accomplished by his group. He pointed out that research on glucose meters is still making progress, although non-invasive glucose measurements have still not proved to work reliably enough for routine applications. Systematic research was carried out on molecularly imprinted polymers (MIPs), based on computational methods. MIP-based sensors now enable measurements with high stability and are therefore likely to open up a wide range of applications.

Other talks illustrated that academic research not only includes basic research on sensors, but also focuses on questions such as new applications and alternative manufacturing techniques. This was demonstrated by Prof. **Gerhard J. Mohr** (University of Jena), who presented examples of optical sen-



Dr. Emel Musluoglu, Prof. Günter Gauglitz, Dr. Fritz Erni and Prof. Anthony P. F. Turner (from left to right) in discussion.

sors based on nanoparticles that can be used for measurements in cells. Prof. **Daniel Citterio** (Keio University, Yokohama) introduced a very simple manufacturing method that relies on ink-jet printing, thus offering new prospects in cost-effective mass production.

Contributions in the *metrology* session (**Petra Spitzer**, Physikalisch-Technische Bundesanstalt PTB, Braunschweig; **Samuel Wunderli**, Swiss Federal Office of Metrology Metas, Bern; **Caspar Demuth**, Zurich University of Applied Sciences) underscored the fact that metrological aspects are becoming increasingly important in analytical chemistry. For successful implementations of chemical sensors in demanding applications such as clinical chemistry, traceability of measurements to defined standards and approved analytical scales for activity are mandatory. However, more needs to be done to establish users' understanding of metrological questions.

Representatives of the *sensor manufacturers* (**Hannes Bühler**, Hamilton Bonaduz; **Christoph Ritter**, Roche Diagnostics; **Markus Graf**, Sensirion) stated that their primary aim is to improve the ease of use of their products. In process analytics, production costs are directly determined by the reliability, reproducibility and maintenance intervals of the sensors in use. These factors are even more crucial for end-users than measurement precision or accuracy. A critical remark was directed towards academic sensor research, suggesting that universities broaden their focus by including questions such as stability, simplicity, speed and selectivity in their studies.

A broad span of *applications* ranging from the food and beverage industry (**Stefan Bardeck**, Mettler Toledo), biotechnology (**Regine Eibl**, Zurich University of Applied Sciences), clinical chemistry (**Reto Savoca**, Cantonal Hospital Schaffhausen) and environmental sciences (**Beat Müller**, Eawag) was presented by experts using chemical sensors in their work. Again the user-friendliness of chemical sensors was discussed. Still too often, accurate measurements can be obtained only if users understand the basic functionality of these devices. To avoid errors, developers and manufacturers of chemical sensors must ensure that operation and handling are less demanding in the future.

The conference was concluded with a contribution by Prof. **Günter Gauglitz** (University of Tübingen). He presented several examples of a wide range of optical detection techniques that have been developed in his group, such as reflectometric interference spectroscopy or surface plasmon resonance. In the space of a few years these methods have been developed from experimental status to prototypes successfully used in real-life applications, thus giving further prospects for the future of chemical sensors.

Conclusion

The Chemical Sensors Forum 2008 successfully brought together experts from different areas to share their views on and visions of chemical sensors. The high number of participants from industry clearly demonstrates that the application of chemical sensors is not just of academic interest. In this respect, the con-



Scientific views: Discussions on top of the Uetliberg tower.



Participants of the Chemical Sensors Forum 2008 share their views and visions at a coffee break.

ference helped to encourage discussions and stimulate new ideas – not least owing to the relaxing atmosphere and the inspiring location on top of the Uetliberg.

The positive response of the participants has encouraged the organising committee to plan a similar conference in the future. Further information on the Chemical Sensors Forum can be found at the conference website (www.chemicalsensorsforum.ch).

Acknowledgements

The authors would like to thank the Swiss Chemical Society (Division of Analytical Chemistry) for the generous financial contribution. Support by the member companies of the KGF (Kontaktgruppe für Forschungsfragen; Ciba, Novartis, F. Hoffmann-La Roche, Merck Serono, and Syngenta), Biotechnet Switzerland and the Swiss National Science Foundation is gratefully acknowledged.

Received: November 29, 2008