

Institute Lecture

From a lab-on-a-microchip to a lab-on-a-molecule

Prof. Michael Schmittel

University of Siegen, Germany

2nd March 2016, Time: 6 PM, Venue: L-5



Abstract

The first part of the lecture is devoted to how to shrink a fully contained, autonomous chemical lab from the desktop to the microchip size. The application specific lab-on-microchip (ALM) is a monolithically integrated technology platform, linking microfluidic networks, microoptical components and microelectronic circuits. With its full-fledged monolithic integration onto a standard application specific integrated circuit (ASIC) the ALM lays the foundation for dramatic reductions of sample volumes and analysis times, thus offering vastly improved speed, reliability and efficiency. In addition, we will learn about superstable organometallic redox systems in self-assembled monolayers that are useful to drive microfluidics.

The second part is devoted to the emerging and fascinating concept how to increase spatial density of sensory information by utilizing single molecular probes that are designed to detect and quantify several analytes in competitive assays. They are denoted as lab-on-a-molecule probes. The underlying idea strongly contrasts the well-known conception of probes driven by a single input signal (the analyte), which have seen a roughly 150 year history starting off with simple colorimetric tests. In our work on lab-on-a-molecule probes we use the multichannel approach as an effective strategy to achieve selectivity in competitive assays. The goal is that analytes exhibit a pronounced response in one channel (absorption, luminescence, electrochemiluminescence, etc.) but are silent in the other channels.

About the speaker

Prof. Dr. Michael Schmittel received Ph.D from Universität Freiburg, Germany in 1985. He was an Assistant Professor of Chemistry (Habilitation), 1988-1992, Universität Freiburg, Associate Professor of Chemistry, 1993-1999, Universität Würzburg, Germany. He is a Full Professor of Chemistry, 1999 - present, Universität Siegen, Germany.

His research interests are thermal and photochemical diradical cyclizations; dynamic metallosupramolecular nanoaggregates; organic technologies for the lab-on-microchip (sensorics, surface patterning); nanoswitches for catalysis and communication; supramolecular nanomachinery.

He is honored with several distinguished awards like BASF Award in Chemistry, Gödecke Award in Chemistry, INSA Lecture Award, NATO-scholarship of the DAAD; JSPS scholarship. Chairman of the Gordon Research Conference 2005 (Organic Free Radicals). Director of the Center of Micro and Nanochemistry and Engineering C_μ, 2005 – present.

Tea at 5.45 PM

All interested are welcome.

Amalendu Chandra

Dean of Research and Development, IIT Kanpur