Fluorescence-based techniques for single-molecule detection

by Dr. Elke Haustein

Date: 26th February 2007 (Monday)
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Venue: LT 3

Abstract

The need for better, minimally invasive diagnostic tools and more specialized instrumentation to answer highly specific (biological) questions has triggered an avalanche in fluorescence-based techniques development. Fluorescence correlation spectroscopy (FCS) is one of the many different modes of high-resolution spatial and temporal analysis of extremely dilute biomolecules. It is a highly versatile approach to determine not only local concentrations and mobility coefficients, but also characteristic rate constants of inter- or intramolecular reactions of fluorescently labeled biomolecules in nanomolar concentrations both in vitro and in vivo.

It is straightforward to combine fluorescence-based techniques with different sample geometries under various experimental conditions. Microfluidic devices, e.g., handle very small volumes of fluids on the order of nano- to picoliters. The availability of chip-based channels or capillaries combined with miniaturized pumps and mixers opens up fascinating prospects to downscale various chemical and biochemical processes, including the investigation of reaction kinetics as well as manipulation and sorting of cells and particles. To successfully apply these microfluidic systems, however, adequate techniques are required to precisely determine flow parameters. This can easily be done by one- and two-photon FCS, allowing thus to monitor and control fluid and particle manipulation.

Dr. Elke Haustein Speaker

Dr. Elke Haustein received her Bachelor’s degree in Physics from the University of Leeds (UK) in 1996 and her Diploma in (Bio-)Physics from the University of Ulm (Germany) in 2000. She then joined the Max-Planck Institute for Biophysical Chemistry in Goettingen (Germany) as a PhD student working on high-resolution single-molecule fluorescence spectroscopy with Prof. Claus Seidel and Prof. Petra Schwille. Together with Prof. Schwille’s research group she moved to TU Dresden in 2004 and finished her PhD on “Fluorescence fluctuation spectroscopy on freely diffusing and spatially confined single molecules” in 2005. Currently Dr. Haustein is a postdoctoral associate and part-time lecturer in the Biophysics Group at the Center for Biotechnology of the Technical University Dresden in Germany, continuing her work with Prof. Petra Schwille on single-molecule fluorescence.

Dr Xue Jun Min Host