ÚFE Ústav fotoniky a elektroniky
Akademie věd ČR

Novel Confinement Methods for Single Molecule Studies

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Hall of the Institute
(13:30 refreshment)

Abstract

The possibility to detect and analyze single biological molecules is of great interest to advance molecular biology. Several methods enable detection of induvial molecules as well as their conformations and interactions, sometimes even in a label-free manner. However, the observation time tends to be limited to ~1 ms since the molecules diffuse away from the detection zone. Hence, there is a great need to confine the biomolecules, but without perturbing them and while maintaining a physiological environment.
I will present a new trapping concept based on nanochambers with volumes as low as one attoliter. By introducing polymer brushes that switch between an extended and a collapsed state, efficient and long-term trapping of multiple proteins in the chambers is possible at physiological salt and pH. At the same time, small molecules and ions can access the trapped proteins through the hydrated brush barrier. Furthermore, in ongoing work we are extending the concept to dual-pore nanochambers, where electrokinetic forces are used to control the content of the nanochambers, aiming for single molecule precision.

Prof. Andreas Dahlin obtained his PhD in bioscience with engineering physics from Chalmers University of Technology in 2008 after performing parts of his PhD studies at Lund University. He spent two years as a postdoc at the Swiss Federal Institute of Technology (ETH) in Zürich, Switzerland, after which he returned to Chalmers and become a senior research fellow. His research has always been interdisciplinary and connected the fields of molecular biology, chemistry and physics. Specifically, he has worked with solid state nanostructures for bioanalytical applications using physical transducer concepts. His group has developed a particularly strong competence in chemical surface modifications and the use of surface sensitive techniques to characterize the properties of soft films such as polymer brushes. Currently, his main research interest is the development of nanopore traps and using them to study biomolecular interactions with single molecule resolution.