

Report from the training course in “Measurement of Biomolecular Interactions”

CASCADE training course “Measurement of Biomolecular Interaction”
Tuebingen, Germany, April 5-7, 2006

The organiser of the course was Manuela Reichert, University of Tuebingen.

12 PhD students, post docs and scientists participated in the course and 11 scientists from University of Tuebingen were involved as teachers. All participants were from non-CASCADE groups and represented seven different European countries.

The objective of the course was to give an introduction to fundamentals of biomolecular interaction processes covering both theoretical and practical aspects. The course comprised of four lectures (Surface Interactions, Spectroscopy, Measurements, Evaluation methods), one short lecture on ellipsometry, three experimental sessions and one practical session for data evaluation. Additionally the participants were offered evaluation of multimedia material in General Optics and Optical Sensors, which was provided for use at the lab computers. For all participants a teaching folder was provided, including a printed version of the lectures and short outlines of the experimental/practical sessions. The participants had also the chance to get introduced in the technology of the AWACSS and RIANA detection platforms, which were used for the detection of environmental and food contaminants. In addition, for all participants there was the opportunity to visit the "Europt(r)ode 2006" (Conference on Optical Sensing) which took place directly before the training course.

The participants received a good overview of several methods used for the preparation of biosensor chips, the characterisation of the layers and the measurement of biomolecular interactions. The practical work in the laboratory and the possibility to discuss questions in detail with the PhD students doing actual research was thoroughly appreciated. Hence, the course furthered not only the exchange of knowledge and the understanding of technical aspects, but also the communication between the groups, which may be a chance for future contacts and cooperation.

The participants evaluated the course using the standard form for evaluation of CASCADE courses. The students were very satisfied with the course but vaster organised social programme would have been appreciated.

CASCADE Training Course, Tübingen, April 5-7, 2006

Measurement of Biomolecular Interaction

Wednesday, April 5, 2006

- 13:00 – 13:30 Introduction; information about the content of the training course
(M. Reichert, 8N08) and organisation details
- 13:30 – 14:45 Interaction surface: with strategies for immobilisation,
(M. Reichert, 8N08) homogeneous and heterogeneous assays, assay types, interaction processes, hydrophobic and hydrophilic surfaces, biomolecular interaction layers such as dextran, polyethylenglycol, and other typical layers for binding receptors, introduction to chemistry, layer properties, characterisation of interaction layers.
- 14:45 – 15:15 Coffee break
- 15:15 – 18:30 First experimental session (three groups).
- 19:30 Get-together for participants and teaching staff
(8A17)

Thursday, April 6, 2006

- 8:30 – 9:45 Spectroscopy: principles of spectroscopy, especially reflectance
(G. Gauglitz, 8N08) and fluorescence measurements, interferometry, evanescence field techniques, micro reflectometry, fluorescent labels, total internal reflection fluorescence, fluorescence resonance energy transfer, basic principles
- 9:45 – 10:00 Coffee break
- 10:00 – 13:00 Second experimental session
- 13:00 – 14:00 Lunch break
- 14:00 – 17:00 Third experimental session
- 17:00 – 17:15 Coffee break
- 17:15 – 18:30 Measurement of interaction processes: single-channel and (G.
Gauglitz, 8N08) spectral measurements to obtain data about kinetic processes, signal-to-noise ratio, limits of detection, calibration measurements, interaction dynamics, basics of process control and fluidics

Friday, April 7, 2006

- 8:30 – 9:30 Introduction to evaluation of affinity reactions; evaluation
(G. Gauglitz, 8N08) problems and curve-fitting techniques, error discussion;
- 9.30 – 10.00 Ellipsometry (theory)
(K. Wöllner, 8N08)
- 10:00 – 10:15 Coffee break
- 10:15 – 11:15 Practical session: evaluation of RIfS measurement data
(J. Jährling, 8D35)
- 11:15 – 11.45 Practical session: evaluation of TIRF data
(M. Ehni, 8A17)
- 11:45 – 12.30 Lunch break
- 12:30 – 13:30 Final discussions
- 13:30 – 15:00 Optional: Evaluation of multimedia material in Optical
(8D35) Spectroscopy
- 15:00 End of course

Experimental session I: Surface modification:

(Goran Markovic, Nina Schweizer)

In experiments molecules will be immobilized to a glass or polymer transducer, photolinking and covalent binding are demonstrated, layers are produced, the various types of assay formats are discussed in principle, some results are presented and discussed.

Experimental session II: RIfS measurement:

(Florian Pröll, Lutz Steinle)

Reflectometric interference spectroscopy is applied to a binding experiment, the data is measured, the curves are discussed, and the quality and principle of the measurement will be discussed with the groups in detail; the instrumentation is explained, single-channel and highly parallelised high through-put screening

Experimental session III: FRET and TIRF:

(Markus Ehni, Nina Käppel/Günther Proll)

Setups for total internal reflection fluorescence and fluorescence resonance energy transfer in micro and nanotiter plates are demonstrated using various types of spotting techniques, wells are filled and surfaces are spotted, principles of micro channels are discussed together with microfluidics.

Practical session: Kinetic evaluatio

(Jan Jährling/Nina Schweizer, Markus. Ehni/Nina Käppel)

The different algorithms for kinetic first and second-order processes for binding and dissociation at the surface are discussed, the difference between thermodynamic and kinetic data is demonstrated for homogeneous and heterogeneous assay types. The program Origin is used, together with other statistical and simulation software.