

SCIENTIFIC AND METHOD MODULES

Module name	Smart and Active Assemblies
Number	2015-A1
Aims	This module links molecular sciences to catalysis on complex, multicomponent and multifunctional active sites. It imparts knowledge on the interaction of active sites and active nanocatalysts with their local environment and the catalytic reaction system, and discusses cutting-edge applications in modern homogeneous, heterogeneous and biocatalysis with the goal of understanding emerging catalytic applications for future needs.
Basics	Recommended knowledge: thematic modules T1, T2, T4 Required knowledge: Organometallic compounds, Transition metal complexes, Nanoparticles, Electronic structure (metals, oxides), Porous solids, Enzymes, Chirality, Catalytic chemistry and kinetics
Contents	Complex assemblies (specific synthesis, modification, structure and catalytic properties, various environments with optimised catalytic activity, selectivity and stability, Conductive and semi-conductive electrode materials), Complex catalysts (functionalized surfaces, enzymes, biofilms, biological systems, immobilisation of catalysts on solid or liquid supports), Complex biocatalysts (developing of engineered enzymes, immobilization of enzymes, surface modification, improved tailor-made biocatalysts, biomimetic catalyst assemblies [zeozymes, artizymes, cells, organisms]), Catalytic activation by smart assemblies (activation of unreactive molecules [CO ₂ , hydrocarbon bonds (methane), water splitting], enantioselective catalysis).
Methods	Active site assemblies (synthesis, genetic engineering, characterisation of textural, electronic and structural properties by spectroscopy, protein characterization, potentiometric and impedimetric analysis, electrical conductivity), Catalysts (porosity analysis, assays, spectroscopy under working conditions, advanced testing).
Type	Two-day block course/ yearly recurrence with modification
Date (month/year)	3/4 December 2015
Time	
Work load	15 hours presence/ 45 hours self-study
Examination	Oral/written
Credit points	2
Responsible scientists	Beck-Sickinger, Gläser, Hey-Hawkins
International guest lecturers	Prof. Rebecca Goss, St. Andrews, UK; Prof. Martin Hartmann, Friedrich-Alexander-Universität Erlangen-Nürnberg; Prof. Vlada Urlacher, Heinrich-Heine-Universität Düsseldorf
Industrial partners	-
Recommendations for literature, e-learning	A. Osbourne, R.J. Goss, G.T. Carter (eds.), "Natural Products: Discourse, Diversity, and Design", Wiley-Blackwell (2014); M. Hartmann, D. Jung, J. Mater. Chem., 20 (2010) 844-857; R. Bernhardt, V. Urlacher, Appl. Microbiol. Biotechnol., 98 (2014) 6185-6203.

SCHEDULE for Module 2015-A1

Time	Lecturer	Programme	Location
Day 1 (Thursday, 03 December 2105)			
09:00 – 09:05	Roger Gläser, Leipzig	Welcoming address	Faculty of Chemistry and Mineralogy, Johannisallee 29 Room 153
09:05 – 10:30	Eva Hey-Hawkins, Leipzig	Introduction to and Immobilisation Strategies for Metalloenzymes	
10:30 – 10:45	<i>Coffee & Tea, Refreshments</i>		
10:45 – 12:15	Annette Beck-Sickinger, Leipzig	Introduction to Enzymes and their Immobilisation	Room 153
12:15 – 13:15	<i>Lunch break</i>		
13:15 – 14:45	Rebecca Goss, St. Andrews	Harnessing Biosynthesis: From Using Biofilms for the Immobilisation of Enzymes for Biocatalysis to Combining Synthetic Biology and Synthetic Chemistry to Generate New Natural Products	Room 153
14:45 – 15:00	<i>Coffee & Tea, Refreshments</i>		
15:00 – 16:30	Andrea Robitzki, Leipzig	Bioelectrocatalytic Screening: Enzyme Based Biosensors Measuring Enzyme Substrate Turnover	Room 153
18:00 – 21:00	<i>Dinner</i>		
Day 2 (Friday, 04 December 2105)			
09:00 – 10:30	Martin Hartmann, Erlangen-Nürnberg	Enzyme Immobilization on Nanoporous Hybrid Materials	SR102
10:30 – 10:45	<i>Coffee & Tea, Refreshments</i>		
10:45 – 12:15	Roger Gläser, Leipzig	Towards the Immobilization of Multi-Enzyme Conjugates on Porous Supports	SR102
12:15 – 13:15	<i>Lunch break</i>		
13:15 – 14:45	Vlada Urlacher, Düsseldorf	Enzyme Immobilization: From Method Development to Industrial Applications	SR102
14:45 – 15:00	<i>Coffee & Tea, Refreshments</i>		
15:00 – 16:00	Discussion / Closing Remarks		

Didactic elements:

Lecture, discussions.

Expected performance:

Active participation in discussions during lectures.