

**SCIENTIFIC AND METHOD MODULES**

| <b>Module name</b>              | <b>Nanoparticles and Catalysis</b>  |
|---------------------------------|---|
| <b>Number</b>                   | 2009-M07  |
| <b>Aims</b>                     | deepen the understanding of generation and handling of nanoparticles and catalysts with nanostructures  |
| <b>Basics</b>                   | basic understanding of heterogeneous catalysis  |
| <b>Contents</b>                 | Nanostructures and nanoparticles are two basic and emerging concepts in modern heterogeneous catalysis. Nanoclusters on microporous carriers are known for a long time and widely applied in various catalytic processes, whereas catalysis with suspended nanoparticles is a relatively new, upcoming approach. Its specific advantages and challenges will be discussed with a focus on applications, e.g., in water treatment processes. |
| <b>Methods</b>                  | techniques for measurement of chemical reaction kinetics<br>characterization of nanostructures and free nanoparticles   |
| <b>Type</b>                     | two-days block course: including lessons, practical exercises and a final examination   |
| <b>Date</b>                     | 17th and 18th of September 2009   |
| <b>Time</b>                     | 9.00 to 17.00   |
| <b>Work load</b>                | 15 h presence / 30 h self-study   |
| <b>Examination</b>              | Oral, 19th and 21st of September 2009   |
| <b>Credit points</b>            | 2   |
| <b>Responsible scientists</b>   | F.-D. Kopinke and R. Gläser   |
| <b>Guest lecturers</b>          | Prof. H. Harms, Dr. K. Schirmer, Prof. C.H. Christensen, Prof. U. Heiz, Prof. K. Tryantafillidis, Dr. A. Georgi, Dr. K. Mackenzie, Dr. Stöcker  |
| <b>Industrial partners</b>      | Sumitomo Chemical Europe  |
| <b>Recommendations for lit.</b> | Nanocatalysis (U. Heiz, U. Landmann, Springer 2006, ISSN 1434-4904), Nanoparticles and Catalysis (D. Astruc, Wiley 2008, ISBN 978-3-527-31572-7).   |

## SCHEDULE 2009

| Time   | Lecturer   | Programme   | Location  |
|--|--|---|---|
| <b>Day 1</b>   |  |   |   |
| 9 - 10 <sup>00</sup>   | Prof. Dr. Frank-Dieter Kopinke, UFZ Leipzig  | Introduction to catalysis with free nanoparticles   | at the University, Chemistry Building room 102                    |
| 10 <sup>15</sup> - 11 <sup>15</sup>  | Prof. Dr. Roger Gläser, Universität Leipzig  | Introduction to catalysis with nanostructured materials   |   |
| 12 <sup>30</sup> - 13 <sup>30</sup>  | Prof. Dr. Ulrich Heiz, TU München  | Concepts for the Understanding of Nanocatalysis   |   |
| 13 <sup>45</sup> - 14 <sup>45</sup>  | Prof. Dr. Hauke Harms, UFZ Leipzig   | Microorganisms and enzymes as natural nanocatalysts   |   |
| 15 <sup>15</sup> - 16 <sup>15</sup>  | Dr. Kristin Schirmer, EAWAG Zürich   | Ecotoxicological evaluation of nanoparticles  |   |
| <b>Day 2</b>   |  |   |   |
| 9 <sup>00</sup> - 12 <sup>00</sup>   | Dr. Anett Georgi, UFZ Leipzig  | Analytical methods for characterization of suspended nanoparticles: a short introduction  | at the UFZ, Permoserstr. 15, room 122                             |
|  | Dr. Anett Georgi and Dr. Katrin Mackenzie, UFZ Leipzig                               | Catalysis with and analytics of nanoparticles: Some practical excercises  |   |
| 13 <sup>30</sup> - 14 <sup>30</sup>  | Prof. Dr. Claus H. Christensen, Haldor Topsøe, Lyngby, Dänemark                      | Design of Heterogeneous Catalysts: From Nano to Mega  | at the University, Chemistry Building room 102                    |
| 14 <sup>45</sup> - 15 <sup>45</sup>  | Dr. Stöcker, Sumitomo Chemical Europe  | Does it really have to be nano?   |   |
| 16 <sup>00</sup> - 17 <sup>00</sup>  | Prof. Dr. Kostas Tryantafillidis, Aristotle University of Thessaloniki, Griechenland | Effect of supported metal particle nano-size on catalytic activity: Case studies of Ag-nanoparticles for ethylene epoxidation and Ru-nanoparticles for N <sub>2</sub> O decomposition |   |
| <b>Day 3+4</b>   |  |   |   |
| 19.09.:<br>8 <sup>30</sup> - 12 <sup>00</sup><br>21.09.:<br>9 <sup>00</sup> - 12 <sup>00</sup> | Prof. R. Gläser<br>Prof. F.-D. Kopinke   | Oral Examinations (single, about 20 min. each)  | Office Prof. Gläser at the university (TA, 5 <sup>th</sup> floor) |