

SCIENTIFIC AND METHOD MODULES

Module name	Magnetic Nanoparticles
Number	2010-M02
Aims	1. Link molecular sciences and materials science; 2. Understand how nano-sized materials with optimized magnetic properties are obtained from molecules or molecular precursors; 3. Understand the properties and applications of these magnetic nanoparticles.
Basics	Principles of molecular magnetism, molecular precursors, stabilization of nanoparticles, superparamagnetism,
Contents	Synthesis, properties and applications of magnetic nanoparticles: 1. Basic Principles of Molecular Magnetism (Kersting) 2. High-spin polynuclear carboxylate complexes and molecular magnets with VII and VIII Group 3d-metals 3. Assembly of core-shell magnetic structures 4. Synthesis of Nanoparticulate Magnetic Materials. 5. Characterisation of Nanoparticulate Magnetic Materials 6. Supermagnetism 7. Electrical Transport in Magnetic Nanostructures 8. Biomedical applications of magnetic nanoparticles.
Methods	Templated Synthesis, Immobilization Techniques, Handling and Characterization of Magnetic Nanoparticles, SQUID-Magnetometry, Moessbauer Spectroscopy
Type	Two-day block course
Date (month/year)	28-29 October 2010
Time	9 a.m. – 6 p.m.
Work load	15 hours presence / 45 hours self-study
Examination	Written
Credit points	2
Responsible scientists	Prof. Dr. Pablo Esquinazi, Prof. Dr. Berthold Kersting
International guest lecturers	Prof. Dr. W. Kleemann (Duisburg-Essen), Prof. Dr. G. Papaefthymiou-Davis (PA, USA), Dr. Beri N. Mbenkum (MPI Stuttgart), Prof. Dr. M. Julve (Valencia, Spain), Dr. Nguyen TK Thanh (London, U.K.), Prof. Dr. Annie Powell (Karlsruhe), Prof. Dr. P. Esquinazi (Leipzig), Prof. Dr. B. Kersting (Leipzig)
Industrial partners	None
Recommendations for literature, e-learning	Nanoparticle Magnetism , G. C. Papaefthymiou, Nano Today 4 (2009) 438; Supermagnetism , S. Bedanta, W. Kleemann, J. Phys. D: Appl. Phys. 42 (2009) 013001, Magnetic Nanoparticles , Gubin, Sergey P. (Hrsg.), Wiley-VCH, Berlin, 1 st Ed. 2009; Coordination Chemistry , J. R. Gispert, Wiley-VCH, Berlin, 1 st Ed. 2008

Schedule

Time	Lecturer	Program	Location
Day 1 (Thursday, October 28 th)			
9:00 – 9:10	Prof. Dr. Pablo Esquinazi Uni Leipzig	Welcoming address	Johannisallee 29, Seminar Room 101 (SR101)
9:15 – 10:30	Prof. Dr. Berthold Kersting, Universität Leipzig	Basic principles of molecular magnetism	
10:30 – 11:00	Coffee & Tea, Refreshments		
11:00 – 12:15	Prof. Dr. Annie Powell, Karlsruhe	High-spin polynuclear carboxylate complexes and molecular magnets with Group 3d-metals	SR101
12:30 – 13:30	Lunch break		
13:30 – 14:45	Prof. Dr. Miguel Julve, Department of Inorganic Chemistry, University of Valencia, Spain	Complex as ligand strategy towards the stepwise formation of nuclearity tailored polynuclear magnetic compounds	SR101
14:45 – 16:00	Dr. Beri N. Mbenkum, MPI for Metals Research, Department of Modern Nanostructured Magnetic Materials, Stuttgart	Assembly of core-shell magnetic structures	SR101
16:00 – 16:30	Coffee & Tea, Refreshments		
16:30 – 17:45	Prof. Dr. Wolfgang Kleemann, Universität Duisburg-Essen	Supermagnetism	SR101
19:00 – 22:00	Conference Dinner: Bayrischer Bahnhof, Registered Participants		
Day 2 (Friday, October 29 th)			
8:45 – 10:00	Prof. Dr. Pablo Esquinazi, Fakultät für Physik und Geowissenschaften, Universität Leipzig	Electrical Transport in Magnetic Nanostructures	SR101
10:00 – 10:20	Coffee & Tea, Refreshments		
10:20 - 11:35	Georgia Papaefthymiou-Davis, Department of Physic, Villanova University, Pennsylvania	Synthesis and Characterisation of Nanoparticulate Magnetic Materials	SR101
11:35 – 12:50	Dr Nguyen TK Thanh, Davy-Faraday Research Laboratory, London	Biomedical applications of magnetic nanoparticles	SR101
12:50 – 14:00	Lunch break		
14:00 – 14:45	Written Examination		SR101
14:45 – 16:00	Mark of the examination (all lecturers)		SR101
16:00 – 16:15	Award Ceremony (for best student) and Closing Remarks		SR101

Didactic elements: Lecture, discussions, presentations.

Expected performance: Active participation in discussions