

Scope

Nanoscale materials are playing an increasing role in materials science and engineering, they are enabler for high-tech products. The improved understanding of structure-property relationships of new materials are essential for their applications in many branches. Basic research is needed to investigate structure and properties of advanced materials on scales from product dimensions down to the atomic level. Multi-scale materials characterization and multi-scale modelling are needed for further materials research and development.

High-resolution analytical techniques are essential for both development and introduction of new nanotechnologies and thin-film technologies as well as for the integration of advanced materials into high-tech products. Nanoanalysis is more and more needed for process and materials characterization during manufacturing of nanostructured systems and devices as well as for the understanding of nanoscale microstructure in materials. Therefore, research and development in the field of physical analysis increasingly focused on the study of thin films and nanostructures. Application-specific developments show often that the combination of several analysis techniques is needed to ensure both process control in nanotechnology as well as performance and reliability of new products.

Numerous new developments in the field of nanoanalysis allow the imaging as well as the structural and chemical characterization of structures in the range < 100 nm, down to atomic dimensions. The suitability of a technique for research and development or for pro-

cess control in manufacturing is determined by the capabilities and limits of the technique itself, particularly if the technique is destructive or non-destructive, but also from the time needed for data acquisition and data analysis ("time-to-data").

The course will provide knowledge in the field of nanoanalysis. Starting with a short introduction, new techniques for the characterization of thin films, nanostructures and nanoparticles will be explained. New results from fundamental research will be presented, and application-specific solutions will be demonstrated as well. Challenges to nanoanalysis techniques in the industry will be an additional topic. Special examples for applied studies in micro-, nano- and optoelectronics as well as in the fields of renewable energies and lightweight construction will be demonstrated. Nanoanalytical studies at metallic, inorganic-nonmetallic and organic materials will be reviewed.

All lecturers are experienced experts in the field of physical and chemical analysis.

The course is intended for individuals who wish to expand their knowledge in the field of nanoscale materials and nanoanalysis. The subjects covered in this course extend from fundamentals of materials science and analysis to the current nanotechnologies and challenges in industry. Scientists, engineers and technicians working in industry, research and education, who are interested to extend their knowledge in nanoanalysis, will benefit from this course.

Speakers / General Information

Chairman of the seminar is
Prof. Dr. Ehrenfried Zschech,
Dresden Fraunhofer Cluster Nanoanalysis, Germany.

The seminar takes place at the Fraunhofer Institute for Nondestructive Testing Dresden branch (IZFP-D), Maria-Reiche-Straße 2, 01109 Dresden (Germany).

Further speakers are:

Prof. Dr. Lukas M. Eng
Dr. Juergen Gluch
Dr. Georg Oertel
Technical University Dresden,
Germany

Dipl.-Ing. Joerg Heber
Dr. Jan-Uwe Schmidt
Fraunhofer IPMS Dresden,
Germany

Dr. Eckhard Langer
GLOBALFOUNDRIES Dresden,
Germany

Dipl.-Ing. Sylvia Mucke
Plastic Logic GmbH, Dresden,
Germany

Dr. Uwe Muehle
Dipl.-Ing. Sven Niese
Fraunhofer IZFP Dresden, Germany

Dr. Annegret Potthoff
Fraunhofer IKTS Dresden, Germany

Participation fee:
1.150,- EURO

Fee for Members of the DGM:
Personal members or 1 non-member from a member institute/member company: 1.050,- EURO

The fee includes:

- Attendance of the seminar sessions
- Comprehensive handouts
- Refreshments during the coffee breaks
- Lunch and dinner*
(* incl. 19% VAT.)

Cancellation policy:

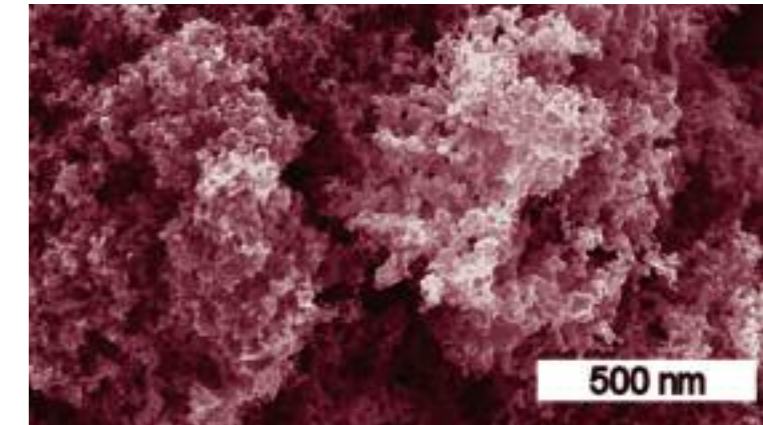
Any cancellation is subject to a cancellation fee of 50% of the fees involved. After 30 October the entire fee is due. Substitution is possible at any time.

For further information please contact:

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European Advanced Training Course

Nano-scale Materials and Advanced Characterization Techniques



3-4 Dec 2013

Dresden, Germany

Dresden Fraunhofer Cluster
Nanoanalysis (DFCNA)

Deutsche Gesellschaft
für Materialkunde e.V.

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The Federation of European
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Tuesday

- 9:00 E. Zschech
Welcome and introduction
- 9:15 E. Zschech
Survey of analysis techniques for multi-scale materials characterization
- 9:45 Coffee Break
- 10:00 E. Langer and S. Mucke
Imaging and element analysis of materials: Scanning electron microscopy and focused ion beam technique
- Introduction to SEM and FIB
- Application in industry: Si-based and organic microelectronics
- Challenges and limits of the techniques
- 12:00 Lunch
- 13:00 U. Muehle and J. Gluch
Atomic resolution studies of materials and interfaces: Transmission electron microscopy
- Imaging: Amplitude and phase contrast
- Structure and strain analysis: Diffraction techniques
- Elemental analysis: EDX and EELS/EFTEM
- Electron tomography
- 15:30 Coffee Break
- 15:45 G. Oertel
Microstructure and texture analysis of submicro- and nano-crystalline materials
- X-ray diffraction
- Electron backscatter diffraction
- Diffraction techniques in TEM
- 17:00 **Lab tour**
- 19:00 Dinner

Wednesday

- 9:00 S. Niese
3D sub-100nm structures in materials and devices: Nano X-ray computed tomography
- Lab-based and synchrotron-radiation-based high-resolution X-ray microscopy and tomography
- Kinetic studies of processes in materials science and engineering
- Examples from materials science and life science
- 10:00 L. M. Eng
High-resolution studies of surface topography and near-surface properties: Scanning probe microscopy
- High-resolution structure analysis in semiconductors: Dopand profiles
- Mechanical strain fields in semiconductors
- Magnetic nanofields in magnetic thin films and nanoparticles
- Structures and fields at atomic dimensions
- 11:15 Coffee Break
- 11:30 N. N.
3D atomic structure in nanoscale materials and devices: Atom probe tomography
- Experimental and analysis techniques
- Sample preparation with focused ion beam
- Application in materials science and nanoelectronics
- 12:30 Lunch
- 13:30 J.-U. Schmidt and J. Heber
Thin film analysis: Optical analysis and metrology, X-ray reflectometry
- Ellipsometry
- Interferometry
- Application to photonic microsystems
- 14:30 E. Zschech
Young's modulus and fracture toughness of nanoscale materials and thin films: Nanoindentation and related techniques
- Hardness and Young's modulus of nanostructures
- Fracture toughness and adhesion
- Degradation and fracture of thin glass films

Wednesday

- 15:30 Coffee Break
- 15:45 A. Potthoff
Characterization of nanoparticles: Chemical and physical analysis techniques
- Dispersion of nanomaterials
- Particle size analysis in suspensions
- Characterization of particle surfaces
- 16:45 E. Zschech
Final remarks
- 17:00 **Lab tour**
- 18:00 **End of the seminar**

Registration

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European Advanced Training Course
Dresden (Germany)

..... DGM-Membership Number

DGM-member
 Non-member

..... Title, First Name(s), Name

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