

# Nano-scale Materials

## Characterization-Techniques and Applications

9 - 11 June 2015, Dresden,  
Germany

Dresden Fraunhofer Cluster Nanoanalysis (DFCNA)

For further information please contact:

Deutsche Gesellschaft für Materialkunde e.V.  
Susanne Grimm · Hahnstraße 70 · D-60528 Frankfurt, Germany  
T +49 (0)69 75306-757 · Zentrale +49 (0)69 75306-750  
F +49 (0)69 75306-733 · fortbildung@dgm.de · www.dgm.de

## 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 the 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 process 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 applicationspecific 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. We are offering a practical half-day lab training in small groups in one of the following fields of research that should be chosen by the participant:

- Scanning electron microscopy/ Focused ion beam
- Particle analysis
- Scanning probe microscopy.

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

## Scope (cont.) / Speakers / General Information

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.

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

Further speakers are:

**Prof. Dr. Lukas M. Eng, Dr. Juergen Gluch, Dr. Markus Loeffler**  
Technical University Dresden, Germany

**Dr. André Clausner, Dr. Uwe Muehle, Dr. Annegret Potthoff**  
Fraunhofer IKTS Dresden, Germany

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

**Dr. Pradeep Konda Gokuldoss**  
Max-Planck-Institut für Eisenforschung, Duesseldorf, Germany

**Dr. Eckhard Langer**  
GLOBALFOUNDRIES Dresden, Germany

**Sylvia Mucke**  
Plastic Logic GmbH, Dresden, Germany

The seminar takes place at the Fraunhofer IKTS, Maria-Reiche-Str. 2 and Winterbergstr. 28 as well as TU Dresden.

**Participation fee:** 1.290 EUR

**Fee for Members of the DGM:** 1.190 EUR  
Personal members or 1 non-member from  
a member institute / member company

**Participants of FEMS member societies receive a 5% reduction!**

**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 5 May the entire fee is due. Substitution is possible at any time.

# Nano-scale Materials

## Characterization-Techniques and Applications

9 - 11 June 2015, Dresden,  
Germany

Dresden Fraunhofer Cluster Nanoanalysis (DFCNA)

**New** Practical lab training in small groups

supported by  
The Federation of European  
Materials Societies (FEMS)

FEMS

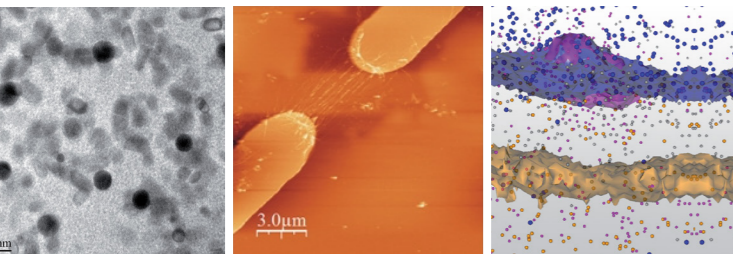
www.dgm.de

DGM

# Tuesday

9 June 2015

- 13:00 E. Zschech  
**Welcome and introduction**
- 13:15 E. Zschech  
**Survey of analysis techniques for multiscale materials characterization**
- 13:45 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 micro-electronics
  - Challenges and limits of the techniques
- 15:30** Coffee Break
- 16:00 U. Muehle and M. Loeffler  
**Atomic resolution studies of materials and interfaces: Transmission electron microscopy**
  - Imaging: Setup and contrast mechanisms
  - Structure and strain analysis: Diffraction techniques
  - Elemental analysis: EDX and EELS/EFTEM
  - Electron tomography
  - In-situ studies
- 17:30 P. Konda Gokuldoss  
**3D atomic structures in nanoscale materials: Atom probe tomography**
  - Experimental and analysis techniques
  - Sample preparation with focused ion beam
  - Application in materials science and nanoelectronics
- 18:30 **Lab tour**



# Wednesday

10 June 2015

- 9:00 J.-U. Schmidt and J. Heber  
**Thin film analysis: Optical analysis and metrology, X-ray reflectometry**
  - Ellipsometry
  - Interferometry
  - Application to photonic microsystems
- 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 nano-particles
  - Structures and fields at atomic dimensions
- 11:00** Coffee Break
- 11:30 A. Potthoff  
**Characterization of nanoparticles: Chemical and physical analysis techniques**
  - Dispersion of nanomaterials
  - Particle size analysis in suspensions
  - Characterization of particle surfaces
- 12:30** Lunch
- 14:30 **Practical lab training in small groups**  
till
- 18:30 1 - E. Langer and J. Huang  
**Scanning Electron Microscopy/Focused Ion Beam**
- 2 - A. Potthoff  
**Particle Analysis**
- 3 - L. M. Eng  
**Scanning Probe Microscopy**
- 19:00** Dinner

# Thursday

11 June 2015

- 9:00 A. Clausner  
**Mechanical properties of nano-scale materials and thin films: Nanoindentation and related techniques**
  - Hardness, Young's modulus and yield stress of nano-structures
  - Nano-scale behavior of metals, ceramics, and glasses
  - Properties and structure of nano-porous materials
- 10:00 J. Gluch and M. Loeffler  
**3D imaging of materials: Micro- and nano X-ray tomography**
  - X-ray tomography: from micro to nano
  - Resolution and field of view
  - Lab-based systems vs. synchrotron research
  - Applications in materials science, electronics and biology
- 11:30 E. Zschech  
**Final remarks**
- 12:30 **Lab tour**
- 13:30** End of the seminar



## Anmeldung Nano-scale Materials Characterization-Techniques and Applications

**9 - 11 June 2015**  
European Advanced Training Course  
in Dresden (Germany)

**Please scan and send via email to:**  
**fortbildung@dgm.de**  
**Or send via fax to:**  
**+49 (0)69 75306 733**

Title, First Name(s), Name	DGM-Membership <input type="checkbox"/> DGM-member <input type="checkbox"/> Non-member
Institute / Company	Phone
Department	Fax
Street	E-mail
Post Code / City / Country	Date, Signature