IAMNano 2019 Düsseldorf

International Workshop on Advanced and *In situ* Microscopies of Functional Nanomaterials and Devices

October 27 – 30, 2019

**Venue:** Max-Planck-Institut für Eisenforschung,
Max-Planck-Str. 1, 40237 Düsseldorf, Germany

[https://www.mpie.de/iamnano2019](https://www.mpie.de/iamnano2019)

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**Scope of the workshop**

The workshop aims to provide a forum for researchers who are interested in applying advanced imaging and spectroscopy methods of electron microscopy, including aberration-corrected, *in-situ*, environmental and low-voltage electron microscopy, to topical issues in materials science and engineering, in nanoscience, in soft matter research, in interface and surface science, and in biomaterials research. As these methods are of fundamental importance in virtually all technological fields, contributions are invited that address the broad spectrum of current materials research. Novel methodological developments will be discussed as well as topical areas of research on thin films, bulk materials, surfaces, materials at the nanoscale and at the interface between the physical and life sciences, for understanding structure-property relationships of materials, as well as for metrology. Selected topics will be introduced by invited keynote speakers during the plenary sessions. A poster session provides room for the presentation and discussion of current research on

- New developments in aberration-corrected transmission electron microscopy (TEM) and scanning TEM (STEM)
- Advanced spectroscopy including energy dispersive X-ray spectroscopy (EDS) and electron energy loss spectroscopy (EELS)
- Electron holography and phase retrieval
- *In situ* and environmental TEM
- Computational microscopy and advanced data analysis
- Multiscale characterisation
- Materials for sustainable energy applications and mobility
- Advanced engineering materials
- Soft and biological materials

**Local organizing committee**

(alphabetical order)

- Gerhard Dehm - MPIE Düsseldorf
- Christian Liebscher - MPIE Düsseldorf
- Christina Scheu - MPIE Düsseldorf / RWTH Aachen
- Bernhard Völker - RWTH Aachen

**Scientific Advisory Board**

(alphabetical order)

- Rafal Dunin-Borkowski - Ernst Ruska Center Jülich, Germany
- Gunther Eggeler - Ruhr Universität Bochum, Germany
- Wolfgang Jäger - CAU University of Kiel, Germany
- Joachim Mayer - RWTH Aachen / FZ Jülich, Germany
- Eva Olsson - Chalmers University, Sweden
- Dierk Raabe - MPIE Düsseldorf, Germany
- Jochen Schneider - RWTH Aachen, Germany
- Robert Sinclair - Stanford University, USA

**Contact information**
e-mail: iamnano2019@mpie.de
Preliminary Conference Program

Oct 27, 2019  SUNDAY  13.30 – 16.30  Registration

13.30 – 16.30  Registration

14.15 – 14.30  OPENING REMARKS & WELCOME  Chair

Opening Session  POTENTIALS OF ABERRATION-CORRECTED (S)TEM  Chair

14.30 – 15.00  Harald Rose (TU Darmstadt, Germany)
Minimum-dose phase-contrast tomography by successive numerical optical sectioning employing the aberration-corrected STEM and a pixelated detector

15.00 – 15.30  Max Haider (CEOS Heidelberg, Germany)
Advancement of high-resolution Electron Microscopes

15.30 – 16.00  Ute Kaiser (Universität Ulm, Germany)
Properties of carbon-based low-dimensional materials from low- or medium-voltage atomic-scale TEM experiments

16.00 – 16.30  COFFEE BREAK & DISCUSSIONS

16.30 – 17.00  Kazu Suenaga (AIST Tsukuba, Japan):
Angular-resolved EELS of low-dimensional materials by means of low-voltage TEM/STEM

17.00 – 17.30  Joanne Etheridge (Monash University)
Tuning STEM: Tailoring the incident and scattered wave fields for optimum specimen information

17.30 – 18.00  Colin Ophus (Lawrence Berkeley National Laboratory, USA)
Phase reconstruction and simulation of STEM experiments in 2D and 3D using the scattering matrix formalism

18.00 – 18.30  Chunlin Jia (Xi’an University & FZ Jülich, China & Germany):
Quantitative HRTEM of functional oxides using negative Cs imaging
<table>
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<tr>
<th>Time</th>
<th>Event</th>
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<tr>
<td>09.00 - 09.30</td>
<td>Christoph Koch (HU Berlin, Germany)</td>
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<td>Computer-assisted imaging and spectroscopy in the TEM</td>
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<td>09.30 - 10.00</td>
<td>Rafal Dunin-Borkowski (FZ Jülich, Germany)</td>
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<td>Towards three-dimensional and atomic-resolution characterisation of</td>
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<td>magnetic moments in the electron microscope</td>
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<td>10.00 - 10.30</td>
<td>Jozef Zweck (University Regensburg)</td>
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<td>Recent developments in imaging of magnetic and electric fields</td>
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<td>10.30 – 11.00</td>
<td>COFFEE BREAK &amp; DISCUSSIONS</td>
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<td>11.00 - 11.30</td>
<td>Sang Ho Oh (Sungkyunkwan University, South Korea)</td>
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<td>In situ atomic-scale observation of polar surfaces of oxides at high</td>
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<td>11.30 – 12.00</td>
<td>Eva Olsson (Chalmers University, Sweden):</td>
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<td>In situ studies of electrical and optical properties of quantum</td>
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<td>12.00 – 12.30</td>
<td>Robert Sinclair (Stanford University, USA)</td>
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<td>The influence of electrochemical testing on the structure of oxide,</td>
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<td>sulphide and nitride thin films, and prospects for in situ studies</td>
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<td>12.30 – 13.30</td>
<td>LUNCH BREAK &amp; DISCUSSIONS</td>
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<td>13.30 – 14.00</td>
<td>Julie Cairney (University of Sydney, Australia)</td>
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<td>Extreme room temperature deformability in ferroelectric oxide pillars</td>
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<td>14.00 – 14.30</td>
<td>Hamish L. Fraser (Ohio State University, USA)</td>
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<td>Nanoscale structural instabilities in metastable beta titanium alloys</td>
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<td>and their role in providing both strengthening and low elastic</td>
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14.30 – 15.00 Heike Gabrisch (Helmholtz-Zentrum Geesthacht, Germany)
   *Evolution of O-phase domains within alpha2 lamellae of a gamma-TiAl alloy*

15.00 – 15.30 Christoph Kirchlechner (MPI Eisenforschung, Germany)
   *Twin boundaries: obstacles for or sources of dislocations?*

15.30 – 16.00 **COFFEE BREAK & DISCUSSIONS**

**Session 4**  **BIOMATERIALS AND SOFT MATTER**

*Chair*

16.00 – 16.30 Jürgen Plitzko (MPI Biochemie Martinried, Germany)
   *In situ structural biology - Cryo-electron tomography of cells and tissue at molecular detail*

16.30 – 17.00 Martin Müller (Helmholtz-Zentrum Geesthacht, Germany)
   *Nanostructure of spider hairs and silk – X-ray and neutron investigations in real and reciprocal space*

17.00 – 17.30 Fu-Rong Chen (City University Hong Kong, China)
   *Toward atomic resolution dynamics for soft materials*

17.30 – 18.30 **Lab Tour**

18.30 – 20.30 **Poster Session - contributed posters**

**GET TOGETHER**

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**Oct 29, 2018**

**TUESDAY**

08.30 – 10.00 Registration

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**Session 5**  **STEM IMAGING AND ANALYSIS**

*Chair*

09.00 – 09.30 Andreas Rosenauer (Universität Bremen, Germany):
   *ISTEM - theory and practice*

09.30 – 10.00 Haijun Wu (National University Singapore, Singapore)
   *Seeing structural origins and foreseeing new pathways to improved lead-free piezoelectrics with aberration-corrected scanning transmission electron microscopy*
10.00 – 10.30  Dagmar Gerthsen (KIT Karlsruhe, Germany)  
STEM, FIB-SEM and EDXS tomography of solid oxide fuel cells

10.30 – 11.00  COFFEE BREAK & DISCUSSIONS

Session 6  SPECTROSCOPY  
Chair

11.00 – 11.30  Gianlugi Botton (Canadian Light Source, University of Saskatchewan and Canadian Centre for Electron Microscopy, McMaster University, Canada)  
Using electrons and photons for materials characterization: where do we think we stand?

11.30 – 12.00  Mathieu Kociak (Laboratoire de Physique des Solides, France)  
Advances in high resolution electron spectroscopies: EELS, EEGS and CL

12.00 – 12.30  Quentin Ramasse (SuperSTEM, UK)  
Monochromated STEM-EELS at the nano-scale: balancing momentum and spatial resolution for advanced spectroscopy

12.30 – 13.30  LUNCH BREAK & DISCUSSIONS

Session 7  MATERIALS FOR ENERGY APPLICATION  
Chair

13.30 – 14.00  Kerstin Volz (Universität Marburg, Germany)  
4D-STEM for energy materials

14.00 – 14.30  Elena Tchernychova (National Institute of Chemistry, Slovenia)  
Structure and defects vs. electrochemical performance in high-power ion batteries

14.30 – 15.00  Velimir R. Radmilović (NCEM, USA)  
Imaging and Spectroscopy of Functional Oxide Nanowires for Energy Related Applications

15.00 – 15.30  Thomas Klassen (Helmut-Schmidt-Universität Hamburg, Germany)  
Nanostructured Materials for Hydrogen Technology

15.30 – 16.00  COFFEE BREAK & DISCUSSIONS

Session 8  CORRELATIVE MICROSCOPY & ATOM PROBE TOMOGRAPHY  
Chair
16.00 – 16.30 Joohyun Lim (MPI Eisenforschung, Germany)
*Detection of trace impurities and other defects in functional nanomaterials*

17.00 – 17.30 Williams Lefebvre (University Rouen, France)
*Correlative microscopy by ex situ combination of APT with STEM and preliminary tests for in situ combination of these techniques*

16.30 – 17.00 Christian Liebscher (MPI Eisenforschung, Germany)
*How do grain boundaries transform on the atomic level?*

17.30 – 18.00 Thomas Kelly (Steam Instruments, Inc., USA)
*Project Tomo: Atom Probe and TEM to Be Combined at Last*

**19:30 CONFERENCE DINNER**

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Oct 30, 2018  
**WEDNESDAY**  
08.30 – 10.00 Registration

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**Session 9  ADVANCED MATERIALS - ALLOYS & STEELS**

*Chair*

09.00 – 09.30 Joachim Mayer (RWTH Aachen, Germany)
*White etching areas - the mistery of premature bearing failures*

09.30 – 10.00 Sophie Primig (UNSW Sydney, Australia)
*Microstructure control during advanced manufacturing*

10.00 – 10.30 Stefanie Sandlöbes (RWTH Aachen, Germany)
*Design of ductile Mg alloys based on combined high resolution electron microscopy experiments and ab initio calculations*

10.30 – 11.00 **COFFEE BREAK & DISCUSSIONS**

**Session 10  IN SITU/IN OPERANDO S/TEM**

*Chair*

10.30 – 11.00 Sandra van Aert (University of Antwerp, Belgium):
*3D atomic scale quantification of nanostructures and their dynamics using model-based STEM*
11.00 – 11.30 Damien Alloyeau (University Paris, France):
Unravel the secrets of metal-nanostructure synthesis with liquid-phase TEM

11.30 – 12.00 Patricia Kooyman (University of Cape Town, South Africa)
Development and use in catalysis research of operando transmission electron microscopy

12.00 – 12.30 Wolfgang Jäger (Universität Kiel, Germany)
advanced and in situ TEM for understanding transport properties of semiconductor interfaces and nanowires

12.30 – 13.30 LUNCH BREAK & DISCUSSIONS

Session 11 IN SITU ELECTRON MICROSCOPY
Chair

13.30 – 14.00 Guillaume Laplanche (Ruhr Universität Bochum, Germany)
TEM investigations of microstructural evolution during tensile deformation of high- and medium-entropy alloys

14.00 – 14.30 Bernhard Völker (Materials Center Leoben, Austria)
In situ SEM study of the fracture behaviour of Cr₂AlC coatings

14.30 – 15.00 Erdmann Spiecker (Universität Erlangen-Nürnberg, Germany)
In situ electron microscopy of nanomaterials in SEM and TEM: New approaches and applications

CONCLUDING REMARKS, COFFEE & FAREWELL

END OF WORKSHOP