

Metal and Material Physics Division Fachverband Metall- und Materialphysik (MM)

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Overview of Invited Talks and Sessions

(lecture IFW A, IFW B, and IFW D; Poster P4)

Invited Talks

MM 1.1	Mon	10:15–10:45	IFW A	Fabrication and Properties of Nanoporous Metals by Electrochemical Dealloying — ●JONAH ERLEBACHER
MM 7.1	Mon	14:00–14:30	IFW A	Non-destructive residual stress analysis with neutrons — ●MICHAEL HOFMANN
MM 12.1	Tue	9:30–10:00	IFW A	Small scale mechanical testing: Challenges and benefits — ●GERHARD DEHM
MM 13.1	Tue	10:15–10:45	IFW A	Small-Angle Neutron Scattering in Materials Science — ●PAVEL STRUNZ, DEBASHIS MUKHERJI, GERHARD SCHUMACHER, RALPH GILLES, ALBRECHT WIEDENMANN
MM 14.1	Tue	11:45–12:15	IFW A	Anomalous small-angle X-ray scattering in material science — ●ARMIN HOELL
MM 19.1	Tue	14:00–14:30	IFW A	Diffusion, interface shifts and solid state reactions in nanoscale — ●DEZSO L. BEKE, ZOLTAN ERDÉLYI, ZOLTAN BALOGH, CSABA CSERHÁTI, GABOR A. LANGER, GABOR L. KATONA
MM 24.1	Wed	9:30–10:00	IFW A	From eutectic alloys to metal nanowires — ●ACHIM WALTER HASSEL
MM 30.1	Wed	14:00–14:30	IFW A	Precipitation-hardening of aluminium alloys - challenges and recent developments — ●JOHN BANHART
MM 36.1	Thu	9:30–10:00	IFW A	Onset of plasticity as observed by force microscopy — ●ROLAND BENNEWITZ

Joined Symposium Chemical Reactions on Nanomaterials: Progress from in-situ Experimental Studies and Theoretical Investigations (SYCR)

Together with CPP, O, DS and VA

In application fields ranging from fuel cells and chemical production to electronic sensors for automotive and environmental monitoring the dream of a rational design of improved catalysts is still elusive. Making this dream a reality ultimately requires an atomic-scale understanding of the complex surface reaction behaviour under realistic operation conditions of the employed multi-component materials, typically composed of metal or alloy nanoparticles supported on an oxide substrate. This involves microscopic details such as the adsorption on different nanoparticle facets, dissolution of gas atoms in the bulk of the nanoparticles, and adhesion to the oxide substrate and thus unites aspects from surface science, material science, as well as physical chemistry.

Substantial effort has been devoted within the past few years to develop new experimental and theoretical techniques capable of delivering such atomic-scale information on surfaces and nanoparticles under reaction conditions, thereby bridging the "pressure gap" from ultra-high vacuum to atmospheric pressures and the materials gap from single crystal (metal) surfaces to (supported) nanoparticles. This symposium will highlight corresponding studies, focusing in particular on the evolution of the active material in technologically relevant environments as e.g. illustrated by the controversially discussed formation of sub-nanometer thin surface oxide layers in oxidation catalytic applications.

Organizers:

Dr. Andreas Stierle
 Max Planck Institut für Metallforschung, Heisenbergstraße 3 D-70569 Stuttgart
 Prof. Dr. Reinhard Denecke
 Wilhelm-Ostwald-Institut für Physikalische und Theoretische Chemie, Physikalische Chemie II,
 Universität Leipzig, Linnéstraße 2, D-04103 Leipzig
 PD Dr. Karsten Reuter
 Fritz-Haber-Institut, Abt. Theorie, Faradayweg 4-6, D-14195 Berlin

Invited talks of the joint symposium SYCR

See SYCR for the full program of the Symposium.

SYCR 1.1	Thu	14:00–14:30	BAR SCHÖ	Reactivity trends in CO oxidation from ultrahigh vacuum to elevated pressures — ●WAYNE GOODMAN
SYCR 1.2	Thu	14:30–15:00	BAR SCHÖ	Ruthenium oxide as oxidation catalyst — ●ROBERT SCHLÖGL, DIRK ROSENTHAL, FRANK GIRSDIES, RAOUL BLUME, OLAF TIMPE
SYCR 1.3	Thu	15:00–15:30	BAR SCHÖ	Low dimensional surface oxides in the oxidation of Rh particles — ●FLORIAN MITTENDORFER
SYCR 1.4	Thu	16:00–16:30	BAR SCHÖ	In-situ microscopy of chemical reactions on transition metal surfaces — ●PETER SUTTER
SYCR 1.5	Thu	16:30–17:00	BAR SCHÖ	Live STM and X-ray observations of catalytic processes — ●JOOST W.M. FRENKEN
SYCR 1.6	Thu	17:00–17:30	BAR SCHÖ	Computational materials design: Alloys for selective hydrogenation catalysis — ●THOMAS BLIGAARD

Topical Sessions

Topical Session Nanoporous Functional Materials

Porous materials combine aspects of granular matter, in particular the large number of surfaces, with behaviour that is characteristic of solids, such as mechanical strength. This has brought porous solids into focus for use as functional materials. Some substances order spontaneously into crystalline structures with regular arrays of interstices, for example, zeolites. Yet, even metals or semiconductors which, conventionally, tend to form bulk materials owing to the trend of nature to spontaneously minimize the area of surface, can be made porous by proper synthesis. This includes in particular the controlled chemical or electrochemical corrosion of elemental semiconductors or of metal alloys. Nanoporous solids represent the lower end of the size scale that can be reached in this way, and the upper end of surface-to-volume ratio. Recent research on nanoporous materials has brought up intriguing science under a variety of aspects, reaching from quantum confinement over sensors and catalysis up to electrochemical tuning of materials properties and size effects in plasticity. In addition, nanoporous materials may serve as template for nanostructuring.

The symposium intends to provide a forum for scientific exchange in this interdisciplinary field of nanoporous functional materials.

Organizers:

Univ.-Prof. Dr. Roland Würschum

Technische Universität Graz, Institut für Materialphysik, Petersgasse 16, A-8010 Graz

PD Dr. Jörg Weissmüller

Institut für Nanotechnologie, Forschungszentrum Karlsruhe GmbH, PO-Box 3640, D-76247 Karlsruhe

Topical Session Nanoanalytics using Small-Angle Scattering with X-rays, Neutrons and Electrons

Small-angle scattering with X-rays, neutrons and even with electrons provides information about features in heterogeneous materials that have sizes on the length scale from typically 2 to 200 nm. Unlike the usual wide-angle Bragg scattering one can therefore characterise the mesostructure of a variety of materials ranging from metals, ceramics, polymers, glasses to complex liquid matter. Chemical sensitivity is provided either by energy variation (X-rays) or isotopic substitution (neutrons). In the latter case, polarisation can also provide magnetic contrast.

The challenges associated with these techniques are manifold: the small-angle scattering signal has to be measured very precisely and the mathematics of evaluating data and deriving a physical model

is challenging. Real-time and in-situ techniques are becoming more popular and require additional efforts.

In this symposium we want to review the recent developments of measurement techniques, the mathematical algorithms and models and present current application examples.

Organizer:

Prof. Dr. John Banhart

Helmholtz Centre Berlin for Materials and Energie, Department of Materials (SF3), Glienicke Str. 100, D-14109 Berlin

Topical Session High Temperature Materials

Fundamental research in high temperature materials is necessary to achieve higher efficiency in transportation and power generation systems. The improvement of established structural materials as nickel-base superalloys is necessary but also the development of new structural material classes as high temperature intermetallics, refractory alloys and coatings. For this an in-depth understanding of the physical processes occurring in the base material and coatings is necessary. Research topics in these often complex multi-component materials are phase transformations and phase constitution either under equilibrium or non-equilibrium conditions, the fundamentals of deformation mechanisms on the nanometer and atomic scale and diffusion controlled processes connected with precipitation, corrosion and a large number of other phenomena. Here the employment of advanced characterization methods like transmission electron microscopy and different diffraction techniques in combination with measurements of the local and global mechanical properties is necessary. These experimental work needs to be connected with modeling on different length scales to fully comprehend the complicated mechanisms occurring in high temperature materials.

The symposium will present the recent progress in several invited talks by leading experts in this field.

Organizers:

Prof. Dr. Mathias Göken

Institut für Werkstoffwissenschaften I, Universität Erlangen-Nürnberg, Martensstrasse 5, D-91058 Erlangen

Dr. Florian Pyczak

GKSS-Forschungszentrum Geesthacht GmbH, Abteilung Metallphysik, Max-Planck-Strasse 1, D-21502 Geesthacht

Prof. Dr. Martin Heilmaier

Otto-von-Guericke-Universität Magdeburg, Institut für Werkstoff- und Füge-technik, Universitätsplatz 2, D-39106 Magdeburg

Sessions

MM 1.1–1.4	Mon	10:15–11:45	IFW A	Topical Session Nanoporous Functional Materials I
MM 2.1–2.3	Mon	12:00–13:00	IFW A	Topical Session Nanoporous Functional Materials II
MM 3.1–3.4	Mon	10:30–11:30	IFW B	Mechanical Properties I
MM 4.1–4.5	Mon	11:45–13:00	IFW B	Mechanical Properties II
MM 5.1–5.6	Mon	10:15–11:45	IFW D	Materials Design I
MM 6.1–6.4	Mon	12:00–13:00	IFW D	Materials Design II
MM 7.1–7.1	Mon	14:00–14:30	IFW A	HV Hofmann
MM 8.1–8.4	Mon	14:45–16:30	IFW A	Topical Session Nanoporous Functional Materials III
MM 9.1–9.4	Mon	14:45–15:45	IFW B	Intermetallic Phases I
MM 10.1–10.3	Mon	16:00–16:45	IFW B	Intermetallic Phases II
MM 11.1–11.6	Mon	14:45–16:15	IFW D	Growth
MM 12.1–12.1	Tue	9:30–10:00	IFW A	HV Dehm
MM 13.1–13.4	Tue	10:15–11:30	IFW A	Topical Session Nanoanalytics using Small-Angle Scattering I
MM 14.1–14.3	Tue	11:45–12:45	IFW A	Topical Session Nanoanalytics using Small-Angle Scattering II
MM 15.1–15.3	Tue	10:15–11:15	IFW B	Topical Session Nanoporous Functional Materials IV
MM 16.1–16.4	Tue	11:30–12:30	IFW B	Diffusion and Point Defects I
MM 17.1–17.6	Tue	10:15–11:45	IFW D	Mechanical Properties III
MM 18.1–18.4	Tue	12:00–13:00	IFW D	Mechanical Properties IV
MM 19.1–19.1	Tue	14:00–14:30	IFW A	HV Beke
MM 20.1–20.21	Tue	14:45–16:30	P4	Poster Session I
MM 21.1–21.9	Tue	14:45–16:30	P4	Topical Session Nanoporous Functional Materials - Poster

MM 22.1–22.2	Tue	14:45–16:30	P4	Topical Session Nanoanalytics using Small-Angle Scattering - Poster
MM 23.1–23.11	Tue	14:45–16:30	P4	Topical Session Heterogeneous Nucleation and Initial Evolution of Microstructure - Poster
MM 24.1–24.1	Wed	9:30–10:00	IFW A	HV Hassel
MM 25.1–25.6	Wed	10:15–12:15	IFW A	Topical Session High Temperature Materials I
MM 26.1–26.4	Wed	10:15–11:15	IFW B	Nanostructured Materials I
MM 27.1–27.5	Wed	11:30–12:45	IFW B	Interfaces I
MM 28.1–28.6	Wed	10:15–11:45	IFW D	Electronic Properties I
MM 29.1–29.4	Wed	12:00–13:00	IFW D	Diffusion and Point Defects II
MM 30.1–30.1	Wed	14:00–14:30	IFW A	HV Banhart
MM 31.1–31.5	Wed	14:45–16:30	IFW A	Topical Session High Temperature Materials II
MM 32.1–32.4	Wed	16:45–18:00	IFW A	Topical Session High Temperature Materials III
MM 33.1–33.7	Wed	14:45–16:30	IFW B	Phase Transitions I
MM 34.1–34.7	Wed	14:45–16:30	IFW D	Liquid and Amorphous Metals I
MM 35.1–35.42	Wed	16:30–18:30	P4	Poster Session II
MM 36.1–36.1	Thu	9:30–10:00	IFW A	HV Bennewitz
MM 37.1–37.6	Thu	10:15–12:00	IFW A	Topical Session High Temperature Materials IV
MM 38.1–38.6	Thu	10:15–11:45	IFW B	Nanostructured Materials II
MM 39.1–39.4	Thu	12:00–13:00	IFW B	Phase Transitions II
MM 40.1–40.5	Thu	10:15–11:30	IFW D	Quasicrystals I
MM 41.1–41.5	Thu	11:45–13:00	IFW D	Interfaces II
MM 42.1–42.7	Thu	14:00–15:45	IFW A	Nanostructured Materials III
MM 43.1–43.7	Thu	16:00–17:45	IFW A	Liquid and Amorphous Metals II
MM 44.1–44.4	Thu	14:00–15:00	IFW B	Quasicrystals II
MM 45.1–45.5	Thu	15:15–16:30	IFW B	Phase Transitions III
MM 46.1–46.5	Thu	16:45–18:00	IFW B	Electronic Properties II
MM 47.1–47.7	Fri	10:15–12:00	IFW A	Liquid and Amorphous Metals III
MM 48.1–48.7	Fri	10:15–12:00	IFW B	Nanostructured Materials IV
MM 49.1–49.6	Fri	10:15–11:45	IFW D	Hydrogen in Metals

Annual General Meeting Metal and Material Physics Division

Wednesday 18:30–19:30 Room IFW B

- Report of the chairman of the Metal and Material Physics Division.
- Invited talks and symposia for the next spring meeting 2010.
- Other topics.