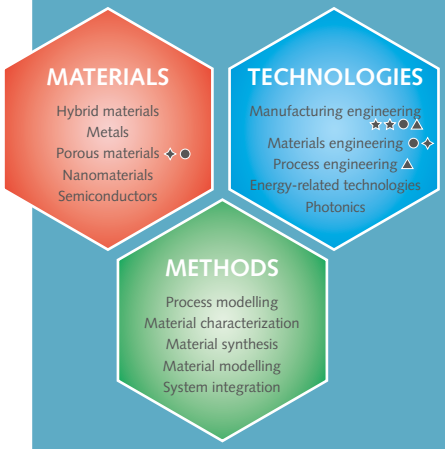
MAPEX Bremen
Material. Process. Excellence.

01
03-2016

NEWSletter

MAPEX CENTER FOR MATERIALS AND PROCESSES

A new form of Research Governance at the University of Bremen, with the aim:



△ Priority Programmes (SPP)
✧ Research Training Groups (GRK)
☆ Collaborative Research Centres (SFB)
● Research Units (FOR)

- To establish and maintain a network of competencies in the fields of materials science, materials engineering, and materials processing
- To increase the visibility of its Research Landscape
- To apply for and participate in third-party funding programs
- To promote cooperative research activities of junior scientists
- To support an interdisciplinary doctoral education
- To cooperatively acquire and share scientific equipment

Research Grants

The MAPEX Center for Materials and Processes invites international PhD candidates to apply for short-term research grants to spend one week to one month at the University of Bremen within the group of a MAPEX member. Proposals from incoming PhD students can be submitted at any time.

MAPEX PhD candidates can apply for outgoing grants to visit international research institutions. Next collection date for outgoing proposals: 31 May 2016. A list of funded projects is available online.

www.uni-bremen.de/mapex
> MAPEX Funding > Research Grant

Workshop funding

MAPEX can fund scientific workshops organized by its members and taking place in Bremen with up to 3000 Euro. Prerequisite is a strong connection to the MAPEX research landscape.

www.uni-bremen.de/mapex
> MAPEX Funding > Workshop Funding

Monthly Lunch Meeting

A monthly jour fixe of the MAPEX Early Career Investigators (ECI) is the informal lunch meeting, taking place every last Tuesday in the month. All interested scientists are invited to get in touch with peers from different faculties and institutes and build up their own network of experts. You don't have to be a MAPEX member to join the meeting and we explicitly also invite PhD students. We will reserve a table in the Mensa (close to the main entrance) and put up a MAPEX sign on the table. There is no official program; everyone pays for his/her own food and drinks.

Upcoming dates are: 29 March 2016, 26 April 2016

2nd MAPEX Young Scientist Workshop

The second MAPEX Young Scientist Workshop will take place on 11 April 2016. The program offers three talks by MAPEX Early Career Investigators and short-lightning presentations by other participants followed by a poster session. A highlight will be the plenary lecture by Fabio La Mantia, a newly appointed professor of the MAPEX network. The day closes with a social evening event.

www.uni-bremen.de/mapex/events
> Workshops

Child care during MAPEX events

To facilitate the participation of young parents at MAPEX events that last until late afternoon, we offer a child-care service, please contact Hanna Lührs for more information.

MAPEX Instrument Database

The MAPEX Instrument Database is online now! It is aimed at facilitating your analytic work by offering a comprehensive list of analytic infrastructure that is available within the groups of MAPEX members. You can browse the database using different categories or perform a keyword search.

In this newsletter we will regularly inform you on the latest additions to the database and present selected methods with examples of scientific applications.

www.uni-bremen.de/mapex
> Instrument Database

1ST MAPEX YOUNG SCIENTIST WORKSHOP – BUILDING BRIDGES

Building bridges across the borders defined by the faculties and institutes.

For the 1st MAPEX Young Scientist Workshop 33 young scientists met in the LION building on 14 October 2015 invited by the MAPEX Early Career Investigators to

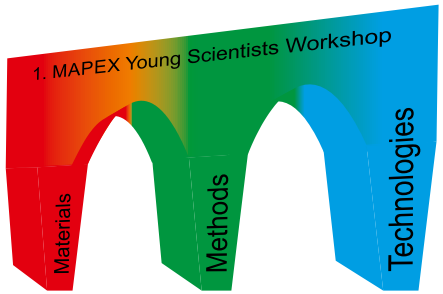
- build bridges across the borders defined by faculties and institutes,
- get an overview about their research topics,
- get to know who offers which expertise and measuring techniques,
- find new cooperation partners,
- build up a network of experts.

Some comments of the participants:

„The informal get together and talks gave an excellent overview on the research activity of the MAPEX investigators."

„It was highly motivating to find synergy effects."

„It is a modern way to interconnect the research at our university and share ideas and methods in committed cooperation. It makes me proud to be part of it."



MAPEX NEIGHBOR VISITS

Get to know what the scientists next door really do….

The MAPEX Early Career Investigators regularly invite all interested students and employees to join them for a short visit (60 minutes) to one of the MAPEX groups/institutes. After a brief introduction, usually there is the opportunity to visit the laboratories and workshops and get insight into the daily work of the MAPEX scientists.

Fascinating insights into the world of micro machining and metalworking fluids were the focus of the first neighbor visit, where Lars Schönemann and Daniel Meyer introduced the department of Manufacturing Technologies and the Laboratory for Precision Machining at the IWT (Stiftung Institut Werkstofftechnik). Melt Atomization and Spray Forming is one focus area within the central research division Process and Chemical Engineering at the IWT where Nils Ellendt offered the second neighbor vistit, introducing the visitors into the enormous effort and impressive machines that are necessary for the generation of metal powders and deposition processes.

What do Hybrid Materials Interfaces (HMI) look like? Susan Köppen took all participants on a virtual tour into the world of atoms and molecules. In a comprehensive overview she explained the different methods and questions that are used and addressed within the Bremen Center for Computational Material Science (BCCMS). The center is dedicated to material and process simulation across multiple size and time scales.

IWT Stiftung Institut für Werkstofftechnik Bremen
Bremen Center for BCCMS Computational Materials Science

MAPEX CALENDAR

29 March 2016 **12:30 Mensa**	MAPEX Lunch Meeting for Young Scientists
11 April 2016	2nd MAPEX Young Scientist Workshop www.uni-bremen.de/mapex > events > workshops
26 April 2016 **12:30 Mensa**	MAPEX Lunch Meeting for Young Scientists
31 Mai 2016 **12:30 Mensa**	MAPEX Lunch Meeting for Young Scientists
6 + 7 June 2016	MAPEX Workshop Haus der Wissenschaft and Uni Bremen

More events, seminars, and talks related to MAPEX topics:
www.uni-bremen.de/mapex > events > calendar

Universität Bremen

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www.uni-bremen.de/mapex

IMPRINT/CONTACT DETAILS

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MAPEX COMMUNITY
People

Universität Bremen

MAPEX SPEAKER **PROF. LUCIO COLOMBI CIACCHI**

the all-round man for new governance in materials science

Since 2014 is Lucio Colombi Ciacchi the speaker of the newly established MAPEX Center for Materials and Processes. He wholeheartedly supports the initiative, actively linking scientists from different faculties and institutes to facilitate and initiate cooperative scientific projects.

The sporty Italian studied Materials Engineering at the University of Trieste, with stays abroad in Regensburg and Dresden, where he later on started his scientific career and obtained his doctorate. After a postdoc phase at the University of Cambridge, he chose Germany as his new scientific basis due to the very open and transparent science system. An Alexander von Humboldt scholarship and an Emmy Noether grant allowed him a high degree of scientific freedom and the chance to build up his own research groups at the Freiburg Fraunhofer Institute for Mechanics of Materials and at the University of Karlsruhe.

In 2008 Lucio Colombi Ciacchi was appointed at the Faculty of Production Engineering at the University of Bremen. As a professor for ‚Hybrid Materials Interfaces' he joined the interdisciplinary Bremen Center for Computational Material Science (BCCMS). His research interests lie at the interfaces between technical materials and biological macromolecules, with a special focus on the dynamics of individual atoms. Embedded both within the BCCMS and the UFT (Center for Environmental Research and Sustainable Technology), his group focusses on atomistic simulations coupled with atomic force microscopy and circular dichroism experiments.

As the dean of studies in his faculty, he devotes himself to all issues concerning teaching and doctoral education: "Especially for young scientists, the interdisciplinary MAPEX network is of enormous benefit."

MAPEX SCIENTIFIC MANAGEMENT **DR. HANNA LÜHRS**

from framework structures to strategic networks

In early 2015 Hanna Lührs joined the MAPEX Center for Materials and Processes as its scientific manager. Together with the MAPEX speaker Lucio Colombi Ciacchi and the executive board, she is jointly responsible for all MAPEX activities and the first contact point for all organizational issues. To her, the support of early career scientists is a matter of utmost importance; she has therefore directly initiated several measures explicitly dedicated to PhD students and postdocs.

Hanna Lührs studied Geosciences and Minerals and Materials Science at the University of Bremen, with two extended internships in the research and development divisions of the BMW goup in Munich and the Robert Bosch GmbH in Gerlingen. She obtained her MSc degree for a crystallographic thesis on zeolite A, an industrially important microporous framework material. For her doctoral thesis, entitled "The Influence of Boron on the Crystal Structure and Properties of Mullite", she was awarded the Bremer Study Price for the best doctoral thesis in the field of natural and engineering sciences. As a postdoc she was involved in the setup of a laboratory for the growth of large single crystals from melts.

With her working experience as an experimental scientist at the University of Bremen, it was a high priority to her to build up a central database containing the analytic infrastructure available within the groups of MAPEX members and facilitating the analytic work, especially for young and newly arrived scientists.

As a passionate skier Hanna Lührs likes to spend her holidays in the mountains together with familiy and friends. Alongside her professional career, she also demonstrates deep social commitment as a longtime member of the executive board of the Bremen Skiing Club, where she leads the ski school with more than 100 active trainers.

CONTACT

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» Common topics and goals and a good interpersonal communication are the essence of a successful cooperation. «

Dr. Hanna Lührs

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» 'We really need to talk to each other' – I hear this sentence whenever scientists meet for the first time during a MAPEX event. «

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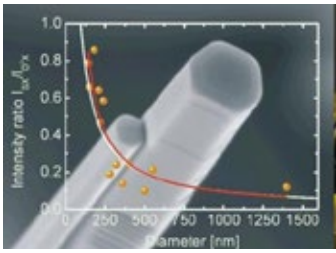
SCIENCE & PROJECTS
MAPEX mission and kick-off meeting

Universität Bremen

MAPEX – MATERIAL, PROCESS, EXCELLENCE

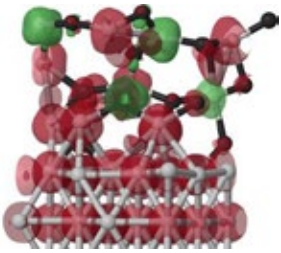
The advancement of technology is intimately connected with the discovery of novel materials and the concomitant development of novel processes to manufacture tools and devices out of them. It has been so since the very beginning of humanity as we know it, in such a prominent way that materials classes are still used to name historical ages (stone, bronze, iron). For their part, synthesis and manufacturing processes have acquired at times mystical connotations, philosophers' stones and God-forged weapons being just prominent examples. In our post-Enlightenment age, mysticism has been replaced by knowledge and empiricism is increasingly giving space to rational, causality-driven design. What remains unchanged and unchallenged is the intertwined link between material and process, a link that nourishes the newly established MAPEX centre and tightly connects all of its seventy members. The consortium encompasses vast knowledge fields of natural and engineering sciences as well as mathematics. It covers the synthesis, characterization and modeling of advanced materials through all subsequent engineering technologies up to the fabrication of machine components with exquisitely tailored functional and structural properties.

The expertise of the participating members spans across a wide and diversified research landscape (see cover page of this newsletter). In the same way as pieces of a puzzle with their own distinctive colors assemble together to reveal a larger picture, the collaborative work performed by the MAPEX scientists contributes to gaining a thorough understanding of the relations and dependencies between materials and processes. Their system-oriented and concomitant development for sustainable transport and energy applications is our driving force. The accurate control of materials chemistry and microstructure at length scales ranging from picometers to meters; the steering of their properties during synthesis, processing and their lifetime usage is what we strive to achieve in our common journey.



J. Gutowski, Institute of Solid State Physics, Uni Bremen

U. Reiß, IWT



L. Colombi Ciacchi, Bremen Center for Computational Materials Science

Materials, Technologies, Methods – the three MAPEX competence areas exemplified by semiconductor nanowires, the heat treatment of a gear wheel and the simulated electronic structure of oxidised chromium (form left to right).

MAPEX comprises about 45 Principal Investigators (PI) and 25 Early Career Investigators (ECI) affiliated to five different University faculties and four external research institutes. Lucio Colombi Ciacchi represents the center as the speaker, with the support of the vice-speaker Ralf Bergmann and the scientific manager Hanna Lührs. Its central decision-making body is the Executive Board, consisting of ten PIs and two ECIs. A five-membered International Advisory Board guides the center with respect to its scientific development and worldwide visibility.

II MAPEX KICK-OFF MEETING 11 MAI 2015

The first public action of MAPEX was the plenary meeting held on 11th May 2015, where a total of 60 Pricipal Investigators, Early Career Investigators, and guests came together to catch up on MAPEX issues and get in touch with other scientists. The inspiring guest lecture of the coordinator of the cluster of excellence „Engineering of Advanced Materials“ at the Friedrich-Alexander-Universtität Erlangen, Prof. Wolfgang Peukert, was a highlight of the meeting. Presentations from all DFG-funded, coordinated research programs within MAPEX completed the program: two Collaborative Research Centers (*Sonderforschungsbereiche*) are the tangible proof of excellent research within the high-profile area. Further results of close collaborations comprise three Research Units (*Forschergruppen*), two Priority Programs (*Schwerpunktprogramme*) and one Research Training Group (*Graduiertenkolleg*).

MAPEX speaker Lucio Colombi Ciacchi presenting the MAPEX milestones.

Wolfgang Peukert, Friedrich-Alexander-Universität Erlangen.

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INSTRUMENT DATABASE
Single Crystal X-ray Diffractometer

Universität Bremen

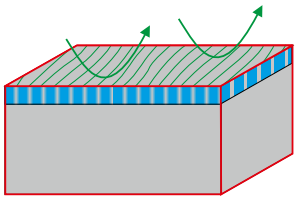
II THE MAPEX INSTRUMENT DATABASE

The database facilitates scientific work by offering a searchable list of analytical equipment available in the groups of MAPEX members. The online database is aimed at making it easier for students, university employees as well as external researchers to learn about analytical methods and get in contact with the responsible instrument operators. You can easily browse through the predefined categories (figure) or perform keyword and text searches.

The MAPEX Instrument Database was launched in November 2015 and it contains by now about 30 instruments. To add new instruments or change details of your instrument, please contact Hanna Lührs or download the registration form from

www.uni-bremen.de/mapex > Instrument Database

In this newsletter, we will regularly inform you of the latest additions to the database and present selected methods with examples of scientific applications.



|| SINGLE CRYSTAL X-RAY DIFFRACTOMETER

Bruker D8 venture Kappa-diffractometer

01 || General Information

Keywords: XRD, single crystal diffraction, single crystal orientation

Categories:

- Diffraction
- Near- / Subsurface Properties
- Material Properties

Main Application: Single crystal diffraction for crystal structure analysis

Measured quantities: Unit cell of single crystals; Orientation of single crystals; X-ray diffraction data for single crystal structure analysis

Year of Fabrication: 2011

02 || Specifications:

- Fast 4-circle Kappa-diffractometer with monochromatic Mo Kα radiation and 2D detector.
- Complete diffraction data sets can be obtained for crystal structure analysis of single crystals of about 100-400 µm diameter.
- Determination of orientation only is also possible for large crystals up to several mm.
- Extremely small amounts of powder are subjected to rotation measurements to achieve powder patterns (however, with rather low resolution in reflection widths) – usually use powder XRD for small samples due to better resolution.
- Single crystals can be investigated at temperatures from -100 to 1000°C.

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