



8th MAPEX Early Career Researcher Workshop

Programme

29th April 2019

TAB Building

**BUILDING
BRIDGES**

across the borders defined
by the faculties and institutes



MAPEX

Materials Methods Technologies

**Early Career Researcher
Workshop**

PROGRAMME - overview

8:30 Registration and poster mounting

9:00 **Session 1**

10:30 Coffee break

10:45 **Session 2**

12:15 Poster session and lunch

13:15 **Session 3**

14:30 Poster session and coffee break

15:00 **Plenary lecture**

16:00 Discussion and coffee

Get together

17:00 Minigolf (Zum Platzhirsch, Kuhgrabenweg 30)

18:00 Dinner restaurant Zum Platzhirsch (at your own expense)

Session 1

09:00 Welcome

*Hanna Lührs, MAPEX
Lucio Colombi Ciacchi, FB04, University of Bremen*

09:15 From gold recovery to cancer detection: Dielectrophoresis for material-selective particle separation

Georg Pesch, FB04, University of Bremen

Dielectrophoresis is a versatile electro-kinetic phenomenon used to solve different particle separation tasks, for example in material recycling. This talk shows recovery of micron-sized gold from plastic particles using the novel high-throughput method of dielectrophoretic filtration. It further outlines how this technique can be used in biomedical applications, for instance for the detection of circulating tumor cells in blood.

09:45 Support of early-career researchers at the University of Bremen

Imke Girßmann, BYRD

10:00 Flashlight presentations

L1 Photocatalytic Activity of a Zinc(II) Phthalocyanine Derivative Immobilized on Various Nanoporous Gold Supports

David Steinebrunner, FB02, University of Bremen

Novel photocatalytically active hybrid materials consisting of ZnPc immobilized on various npAu supports were synthesized and analyzed regarding their structural differences and activity in singlet oxygen formation. The hybrid materials were more active than the same amount of ZnPc in solution indicating a synergistic effect, which was further investigated by irradiation with different wavelengths to achieve selective excitation of the ZnPc, the npAu supports or both components simultaneously.

L2 Nanoporous gold: Tuning of catalytic properties by surface modification

Jorge Adrian Tapia Burgos, FB02, University of Bremen

Nanoporous gold (npAu), can be prepared by leaching a less noble Au alloy component out of the alloy. Residual metal in the material has been found to participate in the reaction by activating molecular oxygen depending on its amount. npAu will be synthesized by dealloying of AuCu alloys, as the Cu shows good reactivity towards oxygen species, and compared to npAu prepared from AuAg. The objective is the optimization of npAu obtained by dealloying AuCu and to perform model-catalytic studies.

L3 In-Situ Characterization and Thermal Decomposition Behavior of Ammonium-Exchanged FAU Type Zeolites

Ahmed Gadelmawla, FB05, University of Bremen

Ammonium-exchanged zeolites, where the NH_4^+ ion represents the charge-compensating cation, play an important role as precursor materials in the production synthesis of H-zeolites. The hydrogen zeolites can be used as catalysts with their protons acting as Brønsted acid sites. Here, we present results on NH_4 -exchanged natural faujasite and synthetic FAU-type zeolites X and Y within the framework of a project studying the mechanisms of deammoniation processes in zeolites by in situ methods.

L4 Crystal growth, crystal structure and optical characterization of CsMTiO_4 (M = Al, Fe and Ga) and $\text{CsTiSi}_2\text{O}_{6.5}$ crystals with tetrahedrally coordinated titanium Ti^{4+}

Jan Derk, FB05, University of Bremen

Electronic polarizabilities are of interest for predicting different physical properties. In this work, the empirical electronic polarizability of Ti^{4+} tetrahedrally coordinated by oxygen ($[4]\text{Ti}^{4+}$) was investigated. Therefore, four different crystals (CsMTiO_4 (M = Al, Fe, Ga) and $\text{CsTiSi}_2\text{O}_{6.5}$) containing $[4]\text{Ti}^{4+}$ were synthesized and chemically, structurally and optically characterized. The investigations resulted in a derived electronic polarizability of $\langle \alpha [4]\text{Ti}^{4+} \rangle = 5.1875 [\text{Å}^3]$.

10:30 Discussion and coffee

Session 2

10:45 High-performance composite materials for additive manufacturing

Ilya Okulov, FB04, IWT

Additive manufacturing is currently shaping our world. The first part of the presentation focuses on general introduction into additive manufacturing. Thereafter, its most important aspect – the design of new materials – is discussed and several useful tips for design are given. The selected examples of materials design for additive manufacturing (including speaker's one) finally demonstrates the beauty of this revolutionary technology.

11:15 Science benefits from diversity

Nele Kuhn, Diversity Management, University of Bremen

Acknowledgement of diversity is both an important condition as well as a sound framework for excellence in research; promoting innovation, creativity, and problem solving. An explicit consideration and inclusion of diverse potentials and perspectives in research fosters excellence, widening participation and sustainability alike. We will look at four core fields of implementation: The recruitment of diverse excellent researchers, diversity competences in a diverse working group, leadership and diversity, as well as the consideration of diversity issues in research activities.

11:45 Flashlight presentations

L5 CoDaPro - Configurable High Throughput Data Processing

Christina Plump, FB03, University of Bremen

The intent of the collaborative research center SFB1232 (Farbige Zustände) is to implement a new method to explore evolutionary materials. The success of this method in part relies on the rapid testing and quick analysis of micro-samples. CoDaPro realizes a configurable component-based architecture and is stream-based, which leads to a quick evaluation performance even when facing huge amounts of data.

L6 Molecular dynamics study of hybrid interfaces

Lena Weber, FB01, University of Bremen

Enzyme-coated ceramics are in great demand in medical diagnostics and for biotechnological applications. Still the surface effects are often not yet clear and thus set limits to the optimization of the processes. In MD simulations, influences such as the symmetry of the adsorbate are discussed as well as effects of surface chemistry by pH or salt concentration. In particular, the simulation results of two proteins, CHT and LYZ on alumina compared to other ceramics are presented.

L7 Interaction between water contaminants and amorphous TiO₂ surfaces

Manuela Romero, FB04, University of Bremen

Amorphous models of TiO₂ surfaces at different pH values are simulated using Molecular Mechanics. Force - Distance curves examining the surface are carried out.

L8 Identification of native defects in MoTe2 monolayers - A DFT study

Eric Macke, FB04, University of Bremen

Defects play a decisive role for future technological applications of 2D transition-metal dichalcogenides (TMD). Using first principle methods, we attempt to identify defect structures that have been observed experimentally on MoTe2 monolayer surfaces with Scanning Tunnelling Spectroscopy. We carry out Density Functional Theory calculations that include spin-orbit coupling effects. With that, we generate maps of the Local Density of States in order to compare them to the experimental results.

Poster session and lunch

12:15 **Poster session and lunch**

Session 3

13:15 **Flashlight presentations**

L9 Potential of rotary swaging

Yang Liu, FB04, bime, University of Bremen

Rotary swaging is an incremental forming process to manufacture axisymmetric components. The process changes the geometry, surface and the microstructure of the parts. Based on the process parameters it is possible to control the part properties. By using flat dies and adapted process kinematics, a polygonal geometry can be achieved with reduced martensitic ratio. In FEM it is shown that with feed per stroke and friction conditions the material flow and final residual stress can be influenced.

L10 Impulse forming: extending material limitations

Björn Beckschwarte, FB04, bime, University of Bremen

Impulse forming like electromagnetic and electrohydraulic forming is a technology facing limitations of conventional forming process. The impulse is extending material limitations in sense of workpiece plasticity and tooling flexibility. During impulse forming material behaviour changes due to dynamic load application. Thus, impulse forming is applied for a wide range of applications. These applications are researched from pulse generation as a driving mechanism to process strategy and tooling.

L11 Experimental investigation of mixing in a T-shaped mixer

Huixin Li, FB04, ZARM, University of Bremen

Fluid mixing is ubiquitous and indispensable in processes engineering. We experimentally study the mixing dynamics of liquids in a T-mixer for different Reynolds numbers. The accurate measurements of small-scale dynamics and scale interactions by non-intrusive techniques (particle image velocimetry and planar laser-induced fluorescence), will facilitate the understanding of the micro mixing which is between the smallest fluid velocity lengthscales and the smallest mixing scalar lengthscales.

13:30 Publish or perish: Good scientific practice in times of open access, predatory publishers and preprint archives

Benjamin Ahlborn, State and University Library Bremen (SUUB)

Publishing is still the linchpin of scholarly communication, but most content is behind publishers' paywalls. Funders are putting increased pressure on both scholars and publishers to make scientific results available in open access. This talk will address questions of "green" OA self archiving, "golden" OA publication fees and the chances and pitfalls of publishing Open Access.

14:00 Flashlight presentations

L12 Composites at high dynamic loads – material studies on explosion protection by Steel-FRP-Sandwiches

Jan Yorrick Dietrich, FB04, University of Bremen

Dual protection concepts for combined blast and impact scenarios are theoretically discussed, tested in radial contact detonations and analyzed by elastic-plastic dynamic and plastic static deformation as well as visual inspection and put into relation to simple compression wave propagation theory as well as basic static material properties.

L13 A process to realize direct laser written electrostatic actuator elements in a closed microcavity

Sina Reede, FB01, IMSAS, University of Bremen

An electrostatic actuator made by 2-photon polymerization and integrated in a microcavity is presented. The cavity is closed by low-temperature wafer-to-wafer bonding of Parylene-C coated silicon and glass wafers. The actuator consists of a free-standing, electrically connected, movable platform with an outer diameter of 260 μm which can act as a microfluidic valve and is supported by springs. The process includes the patterning of metal on the glass wafer containing 76 μm high structures.

L14 Nanofluid Thermal Conductivity Dependency Using Multivariate Analysis

Julia Tielke, FB04, ZARM, University of Bremen

The Thermal Conductivity of heat transfer fluids can be increased by the addition of nanoparticles. These dispersions are known as Nanofluids. We generated a database containing experimental data and modeled the effective thermal conductivity of different nanofluids with respect to concentration, particle size, temperature, and material.

L15 Macroscopic model for flows in porous media based on the pore scale prevalence

Feixiong Rao, FB04, ZARM, University of Bremen

A porous media consists of a solid matrix with an interconnected void. Brinkman term is added to Darcy equation in no-slip boundary condition due to momentum dispersion. However, due to complex geometries, it is difficult to deal with the boundary condition in porous media. Being different to Brinkman term, this paper derives one new model according to Navier-Stokes equations. This new model is more precise and reasonable.

L16 Direct Numerical Simulation and Modeling of Turbulent Convection in Porous Media

Stefan Gasow, FB04, University of Bremen

The purpose of this project is to better understand the physics of turbulent convection in porous media. In order to attain this objective, microscopic direct numerical simulation methods, in which the detailed flows within the porous elements are taken into account, are used. The final aim of this project is to develop a more accurate macroscopic model for calculating turbulent porous medium convection.

Poster session and coffee

14:30 Poster session and coffee

Notes ...

Recent advances in gear manufacturing

*Prof. Dr.-Ing. habil. Prof. h.c. Dr. h.c. Dr. h.c. Bernhard Karpuschewski
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Gears are known as being one of the eldest machine elements of mankind. Already more than 2300 years ago human beings made use of the concept of interacting teeth in rotational coupling of axes. Since then enormous progress was made regarding the improvement, understanding and capabilities of gears. Nowadays some critical voices are questioning the future of gears and even name them “dinosaurs”, i.e. they claim that these essential parts are in danger of extinction from the technical world.

In this presentation the attempt will be made to highlight the importance of gears and the recent progress that was achieved in manufacturing of these highly relevant machine elements. Aspects of current research regarding soft machining, heat treatment and finishing with different state-of-the-art manufacturing processes will be discussed, taking into account the possibilities to support experimental work on these complex geometries by process adapted process modelling and simulation. Just a look at the broad variety of manufacturing options to realise a gear as shown in Fig. 1 is reflecting the still existing global importance of gears. The ultimate aim of this presentation is to emphasize the current and also future dominating role of this machine element.

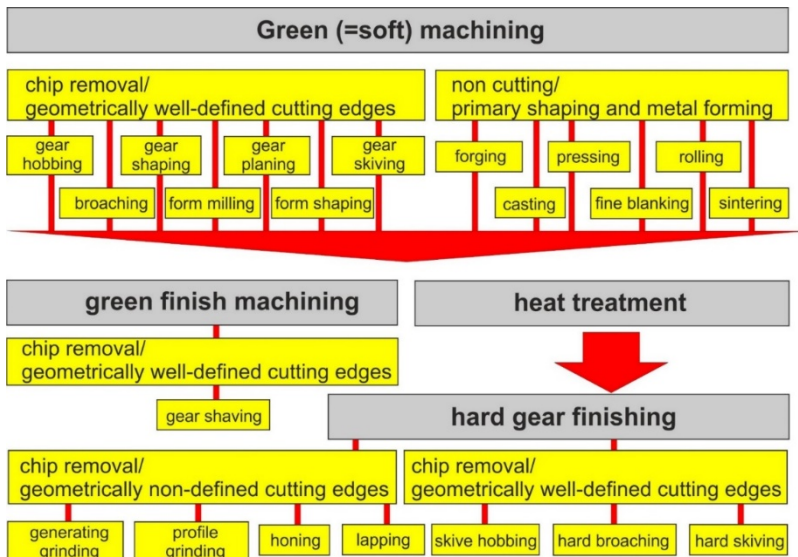


Fig. 1: Available process chains for gear manufacturing.

Locations

Scientific programme 9:00 – 16:00

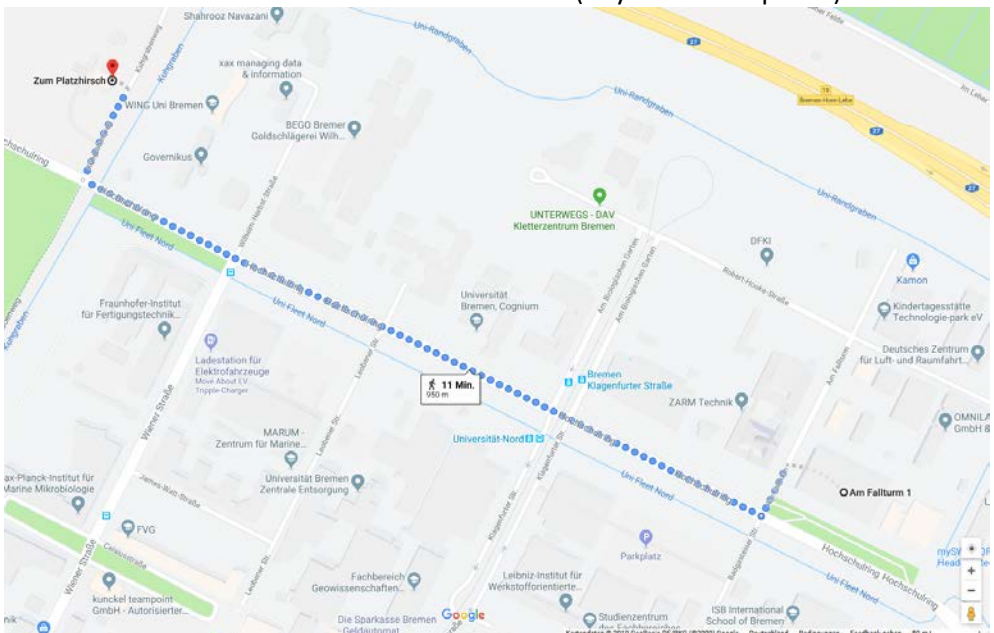
TAB building
Am Fallturm 1
Entrance F



Social event and dinner

17:00 Minigolf (Zum Platzhirsch, Kuhgrabenweg 30)

18:00 Dinner restaurant Zum Platzhirsch (at your own expense)



Organizing committee

Hanna Lührs, MAPEX

Britta Hinz, MAPEX

Bastian Dincher, photographer

Eric Macke, ProMat

Jan Yorrick Dietrich, ProMat

Hanfang Ma, MAPEX

List of Participants

1. **Alexander Adam**, Fraunhofer IFAM
2. **Benjamin Ahlborn**, State and University Library Bremen (SUUB)
3. **Karim Altona**, FB05, University of Bremen
4. **Kerstin Avila**, FB04, University of Bremen
5. **Bastian Bäuerlein**, FB04, ZARM, University of Bremen
6. **Suleyman Bayrak**, FB04, Fraunhofer IFAM
7. **Björn Beckschwarte**, FB04, bime, University of Bremen
8. **Martin Castillo**, FB04, ZARM, University of Bremen
9. **Dhia Charni**, FB04, University of Bremen
10. **Lucio Colombi Ciacchi**, FB04, University of Bremen
11. **Jan Derk**, FB05, University of Bremen
12. **Jan Yorrick Dietrich**, FB04, University of Bremen
13. **Bastian Dincher**, photographer
14. **Michael Fischer**, FB05, University of Bremen
15. **Ahmed Gadelmawla**, FB05, University of Bremen
16. **Stefan Gasow**, FB04, University of Bremen
17. **Imke Girßmann**, BYRD
18. **Onur Görmüs**, FB04, University of Bremen
19. **Britta Hinz**, MAPEX
20. **Bernhard Karpuschewski**, FB04, IWT
21. **Susan Köppen**, FB04, University of Bremen
22. **Nele Kuhn**, Diversity Management, University of Bremen
23. **Huixin Li**, FB04, ZARM, University of Bremen
24. **Yang Liu**, FB04, bime, University of Bremen
25. **Frieder Lucklum**, FB01, IMSAS, University of Bremen
26. **Hanna Lührs**, MAPEX
27. **Hanfang Ma**, MAPEX
28. **Eric Macke**, FB04, University of Bremen
29. **Markus Murawski**, FB04, University of Bremen
30. **Bünyamin Musluoglu**, University of Bremen
31. **Ilya Okulov**, FB04, IWT
32. **Svetlana Ortmann-Ishkina**, FB04, University of Bremen
33. **Arouna Patououssa Mouchili**, FB04, University of Bremen
34. **Georg Pesch**, FB04, University of Bremen
35. **Christina Plump**, FB03, University of Bremen
36. **Feixiong Rao**, FB04, ZARM, University of Bremen
37. **Sina Reede**, FB01, IMSAS, University of Bremen
38. **Manuela Romero**, FB04, University of Bremen
39. **Christian Schenck**, FB04, University of Bremen
40. **David Steinebrunner**, FB02, University of Bremen
41. **Dirk Stöbener**, FB04, BIMAQ
42. **Jorge Adrian Tapia Burgos**, FB02, University of Bremen
43. **Magdalena Thode**, FB04, ZARM, University of Bremen
44. **Julia Tielke**, FB04, ZARM, University of Bremen
45. **Lena Weber**, FB01, University of Bremen
46. **Arne Wittstock**, FB02, University of Bremen

8th MAPEX Early Career Researcher Workshop

With the aim of “building bridges” across faculties and institutes, the event seeks to encourage early stage researchers to boost their careers through interdisciplinary exchange.

In the workshop, invited keynote presentations will pave the way for short lightning talks and extended poster sessions to allow open discussions and networking.

The workshop is a good platform to ...

- get in touch with peers, build up your own network of experts;
- learn from others, think outside the box;
- open doors to other experts – become aware of the huge potential for mutual support that you can access on the short way;
- develop ideas for cooperative research projects;
- discover the offers for early career researchers by BYRD;
- learn what to consider when publishing pre-prints or open access.



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