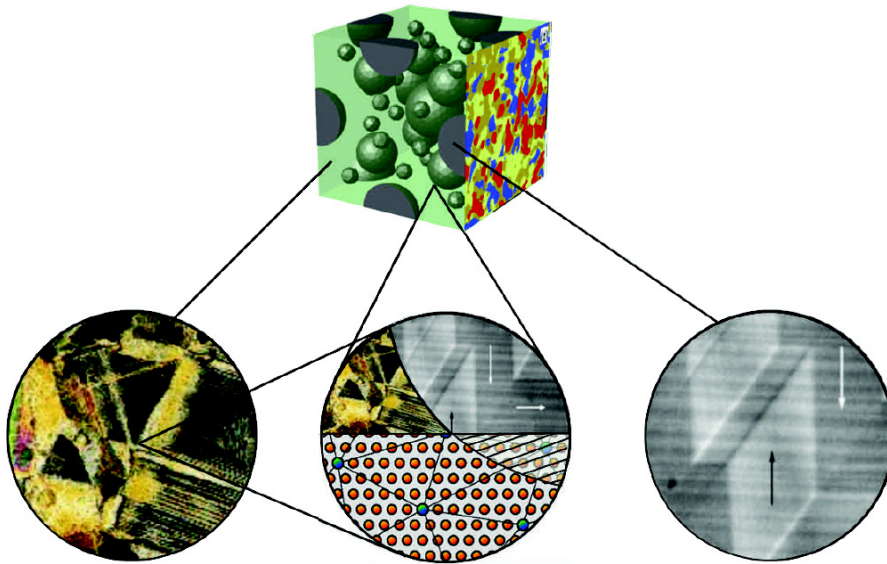


Program
of the Second Seminar on
**THE MECHANICS OF
MULTIFUNCTIONAL MATERIALS**



Physikzentrum Bad Honnef

May 5 - 9, 2014

Welcome

Dear participant,

we are glad to welcome you at the *Second Seminar on the Mechanics of Multifunctional Materials* at the “Physikzentrum” of Bad Honnef.

Multifunctional materials are key ingredients in many modern technical devices ranging from consumer market items to applications in high-end equipment for automobile, aircraft, spacecraft, and information technology. The understanding and development of multifunctional materials is based on a comprehensive understanding of both the experimental and the theoretical details of these materials. Thus, we are delighted to welcome in this seminar national and international experts in continuum mechanics, applied mathematics, and materials science. The topics addressed in the lectures will span modeling, simulation, and experiments in fields ranging from ferroelectrics and -magnets, multiferroics and multiferroic composites, magnetorheological and electroactive elastomers, lithium ion batteries, to polymer blends, alloys, and porous media. This great range of inherently allied fields allows for a broad and deep insight into the scientific activities and advancements of all the research disciplines involved.

The financial support through the *Deutsche Forschungsgemeinschaft* in the framework of the Research Unit 1509 “Ferroic Functional Materials – Multiscale Modeling and Experimental Characterization” is gratefully acknowledged.

We wish us all a pleasant stay with productive discussions and presentations of high scientific impact.

The Organizers

Jörg Schröder
Doru C. Lupascu
Marc-André Keip
Dominik Brands

Miscellaneous

Objectives of the Seminar

The chief aim of the seminar is to discuss various aspects of multifunctional materials. It intends to foster greater interaction among both young and established researchers from continuum mechanics, applied mathematics and materials science working in the fields:

- theoretical and computational modeling of multifunctional materials
- mathematical analysis and variational formulations
- multiscale methods and homogenization
- experimental preparation and characterization
- design of new functional materials with enhanced properties

Organizing Committee

Prof. Dr.-Ing. habil. Jörg Schröder
University of Duisburg-Essen
Faculty of Engineering
Department of Civil Engineering
Institute of Mechanics
Universitätsstr. 15
D-45141 Essen

Prof. Dr. rer. nat. Doru C. Lupascu
University of Duisburg-Essen
Faculty of Engineering
Institute for Materials Science and Center for
Nanointegration Duisburg-Essen (CENIDE)
Universitätsstr. 15
D-45141 Essen

Jun.-Prof. Dr.-Ing. Marc-André Keip
University of Stuttgart
Institute of Applied Mechanics (CE), Chair I
Pfaffenwaldring 7
D-70569 Stuttgart

Dr.-Ing. Dominik Brands
University of Duisburg-Essen
Faculty of Engineering
Department of Civil Engineering
Institute of Mechanics
Universitätsstr. 15
D-45141 Essen

Location

The seminar will be held in the Physikzentrum Bad Honnef, which is located in the south-east of Bonn. Since 1976 the Physikzentrum Bad Honnef has been serving as the main meeting point of the German Physical Society. It offers a secluded setting for research conferences, seminars and workshops, and has proven to be especially stimulating for fruitful discussions. The stately mansion housing the PBH is surrounded by a park at the foot of the Siebengebirge on the right bank of the Rhine river. In the neighbourhood an extensive net of hiking-paths in Germany's oldest nature preserve invites pleasant short or long walks.

Physikzentrum Bad Honnef

Hauptstr. 5, 53604 Bad Honnef, Germany

phone: ++49 (0)2224 92 32 13

web: <http://www.dpg-physik.de/dpg/pbh/index.html>



Arrival by taxi:

in Bad Honnef and Rhöndorf call +49-(0)2224-2222 or +49-(0)2224-2121.

Arrival by train:

From Cologne: Direction Koblenz (right bank of Rhine) to Rhöndorf.

From Frankfurt:

- via Siegburg (ICE) to Troisdorf and then to Rhöndorf (right bank of Rhine).
- via Koblenz (nearly the same duration, but cheaper).

From Bonn: S-Bahn 66 to “Am Spitzenbach”, then 5 min walk to Physikzentrum.

Arrival by car:

From North: A3 - Heumar Dreieck - A59, B42 to Bad Honnef exit Rhöndorf, follow Rhöndorfer Straße, Hauptstraße (approx. 2 km), Physikzentrum Bad Honnef will be at the left hand side.

From South: A3 Frankfurt-Köln exit Bad Honnef-Linz pass the “Schmelztal” to Bad Honnef, follow Hauptstraße until sharp left turn, then turn right (Am Saynschen Hof), follow this street approx. 1.5 km, Physikzentrum Bad Honnef will be at the right hand side.

Local Transportation

Public local transportation is provided by the “Verkehrsverbund Rhein Sieg” (<http://www.vrsinfo.de/index.php>).

Accommodation

Accommodation is included in the conference fee and provided in the Physikzentrum Bad Honnef.

Insurance

Participants are responsible for their own insurance. The organizers cannot be held liable for any damages, losses or accidents occurring during the journey to/from Bad Honnef or during the seminar. All guests participate at their own risk.

Language

The official language of the seminar is German and English. The presentations should be given in **English**.

Presentation Duration

The invited keynote lectures are scheduled to 60 minutes and the further lectures to 30 minutes. Both duration are including discussion time.

Presentation Facilities

The lecture room will provide video beamer, overhead projector, blackboard and internet access.

Homepage of the Seminar

The pdf-version of this seminar program and the seminar proceedings can be downloaded at <https://www.uni-due.de/mechanika/smmm2.shtml>

Social Event

Wednesday, May 7th, 14:30: Excursion to the “Drachenfels”, which is a 1 hour hike from the Physikzentrum and which provides a panoramic view over the Rhine-area near Bad Honnef. During the descent from the “Drachenfels”, which starts at 17:00, we will welcome in the vineyard of the wine-growing estate “Broel” (<http://www.weingut-broel.de/>) for a small snack. From there we will guided to the main building of the wine-growing estate “Broel”. There a “Winzervesper” (dinner in wine grower style) will be provided for us. The official part of the social event will be closed by a candlelit guide through the wine cellar.



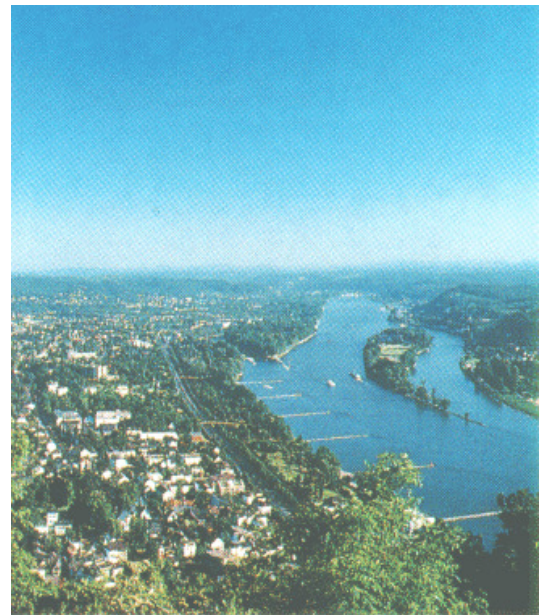
Exterior view of the wine-growing estate “Broel”



Wine cellar of the wine-growing estate “Broel”



Ruin of the “Trutzburg” at the top of the “Drachenfels”



View from the “Drachenfels”

Program

Timetable						
	Monday	Tuesday	Wednesday	Thursday	Friday	
09:00		E. Quandt	M. Kamlah	B. Dkhil	S. Klinkel	09:00
09:30		(keynote)	(keynote)	(keynote)	(keynote)	09:30
10:00		H. Wende	D. Schrade	A. Avakian	A. Menzel	10:00
10:30		Z. Wang	M.-A. Keip	M. Kabel	M. Hossain	10:30
11:00		coffee break	coffee break	coffee break	coffee break	11:00
11:30		K. Dörr	B. Walter	M. Kuna	M. Schneider	11:30
12:00	registration	(keynote)	G. Ethiraj	(keynote)	M. Tanaka	12:00
12:30		D. C. Lupascu	C. Spieler	S. Lange	closing	12:30
13:00	lunch break	M. Labusch		S. Stark		13:00
13:30		lunch break	lunch break	lunch break	lunch break	13:30
14:00	registration					14:00
14:30		R.M. McMeeking	excursion	E. Soergel	end	14:30
15:00	welcome	(keynote)		(keynote)		15:00
15:30	G.P. Carman	R. Gellmann		K. Webber		15:30
16:00	(keynote)	F. Endres		Y. Zuo		16:00
16:30	coffee break	coffee break		coffee break		16:30
17:00	K. Weinberg	poster session		N. Kraynyukova		17:00
17:30	H.-D. Alber			K. Buckmann		17:30

Note: The timetable is interactively linked. Klick on each session to jump directly to the details.

Monday, May 5th

12:00 - 13:00	Registration
13:00 - 14:00	Lunch
14:00 - 15:00	Registration
15:00 - 15:30	Welcome reception in the lecture hall
15:30 - 16:30	Chair: J. Schröder
<i>M. Keller, C.-Y. Liang, and G.P. Carman</i> (Keynote) Modeling of magnetoelastic nanostructures with a fully coupled mechanical-micromagnetic model	
16:30 - 17:00	Coffee break
17:00 - 18:00	Chair: D. Gross
<i>K. Weinberg</i> Thermal diffusion in polymer blends	
<i>H.-D. Alber</i> A precise formula for the propagation speed of diffusive interfaces in the Allen-Cahn phase field model for phase interfaces in solids	

⇒ TIMETABLE

Tuesday, May 6th

9:00 - 11:00

Chair: D.C. Lupascu

E. Quandt (Keynote)

Giant magnetoelectric thin film composites

H. Wende

Tuning the electric polarization in $\text{CoFe}_2\text{O}_4/\text{BaTiO}_3$ nanocomposites by magnetic fields

Z. Wang, A. Avakian, and A. Ricoeur

Comparison of different approaches for the numerical homogenization in magneto-electro-elastic composites

11:00 - 11:30

Coffee break

11:30 - 13:30

Chair: A. Menzel

K. Dörr, A. Herklotz, E.-J. Guo, R. Roth, S. Das, M. D. Biegalski (Keynote)

Ferroic properties of transition metal oxides controlled by elastic strain

M. Etier, V.V. Shvartsman, Y. Gao, S. Salamon, J. Landers, H. Wende, and D.C. Lupascu

Magnetoelectric (0-3) Cobalt Ferrite Barium Titanate Composites, a Nanoscale to Macroscale Investigation

M. Labusch, M.-A. Keip, J. Schröder, and D.C. Lupascu

Strain-induced product properties of two phase magneto-electric composites

13:30 - 14:30

Lunch break

14:30 - 16:30

Chair: R. Müller

R.M. McMeeking and C.M. Landis (Keynote)

Fracture and adhesion in an infinite ferroelectric strip subject to electric field and stress

R. Gellmann and A. Ricoeur

Numerical analysis of domain switching and damage evolution in ferroelectric devices

F. Endres and P. Steinmann

On an atomistic scale finite element method for the simulation of ferroelectric functional materials

16:30 - 17:00

Coffee break

17:00 - 18:00

Poster Session

⇒ TIMETABLE

⇒ TIMETABLE

Wednesday, May 7th

9:00 - 11:00

Chair: B. Svendsen

M. Huttin, J. Ott, A.-C. Walk, and M. Kamlah (Keynote)

Modeling the interaction of lithium insertion and mechanics in electrodes of lithium ion batteries

D. Schrade, R. Müller, and D. Gross

Phase field modeling in ferroelectric materials in the context of size effects

M.-A. Keip and K. Bhattacharya

A phase field model for nematic elastomers: continuum mechanical formulation and finite element implementation

11:00 - 11:30

Coffee break

11:30 - 13:00

Chair: B. Kiefer

B. Walter, P. Saxena, J.-P. Pelteret, J. Kaschta, D.W. Schubert, and P. Steinmann

On the Preparation, Characterisation, Modelling and Simulation of Magneto-Sensitive Elastomers

G. Ethiraj, D. Zäh, and C. Miehe

Micromechanically-based modeling of magneto-visco-elasticity of magneto-sensitive-elastomers

C. Spieler, M. Kästner, J. Brummund, and V. Ulbricht

Finite strain modeling, homogenization and effective behavior of magnetorheological elastomers

13:00 - 14:30

Lunch break

14:30 -

Excursion

⇒ TIMETABLE

⇒ TIMETABLE

Thursday, May 8th

9:00 - 11:00

Chair: D.C. Lupascu

B. Dkhil, A. Bartélémy, and M. Bibes (Keynote)

Strain-tuning in multiferroics

A. Avakian, R. Gellmann, and A. Ricoeur

Nonlinear Ferroelectric-Ferromagnetic Behavior of Multiferroic Composites

M. Kabel, H. Andrä, and S. Staub

Microscopic Simulation of Thermally-Induced Second Order Eigenstresses in Al-Si Alloys

11:00 - 11:30

Coffee break

11:30 - 13:30

Chair: T. Bartel

M. Kuna and B. Nassauer (Keynote)

Configurational forces concept for spatial crack configurations in ferroelectric materials

S. Lange, A. Ricoeur and R. Merkel

A condensed approach to modeling and analysis of tetragonal and rhombohedral ferroelectrics

S. Stark and H. Balke

On the strain and polarisation saturation of PZT ceramics

13:30 - 14:30

Lunch break

14:30 - 16:30

Chair: M.-A. Keip

E. Soergel (Keynote)

Quantitative Piezoresponse Force Microscopy

K.G. Webber, Y.-H. Seo, F.H. Schader, D.J. Franzbach, and J. Koruza

The influence of field-induced phase transitions on the mechanical and electrical behavior of perovskite ferroelectrics

Y. Zuo, Y.A. Genenko, and B.-X. Xu

Phase field study on domain structure stability and domain wall conductivity by screening charge in ferroelectrics with point defects

16:30 - 17:00

Coffee break

17:00 - 18:00

Chair: D. Brands

N. Kraynyukova

Existence and uniqueness result for ferroelectric models in cylindrical domains

K. Buckmann, B. Kiefer, T. Bartel, and A. Menzel

Modeling of Single Crystal Magnetostriction Based on Numerical Energy Relaxation Techniques

⇒ TIMETABLE

⇒ TIMETABLE

Friday, May 9th

9:00 - 11:00

Chair: M.-A. Keip

S. Klinkel (Keynote)

Dielectric elastomers - numerical modeling of nonlinear electroelasticity

A. Menzel, R. Denzer, A. Ask, and M. Ristinmaa

On inverse-motion-based form finding and configurational mechanics for electro-active polymers

M. Hossain, D.K. Vu, and P. Steinmann

On characterization of the electro-mechanically coupled properties of VHB 4910 polymer

11:00 - 11:30

Coffee break

11:30 - 12:30

Chair: J. Schröder

M. Schneider and M. Kabel

The Lippmann-Schwinger equation in elasticity for porous media

M. Tanaka, M. Fujikawa, D. Balzani, and J. Schröder

Application of Robust Numerical Derivative Approximations to Finite Strain Constitutive Models

12:30 - 13:00

Closing

13:00 - 14:30

Lunch break

⇒ TIMETABLE

Participants

Alber, Hans-Dieter	TU Darmstadt, Fachbereich Mathematik Arbeitsgruppe Analysis/Partielle Differentialgleichungen alber@mathematik.tu-darmstadt.de
Anusca, Irina	Universität Duisburg-Essen, Institut für Materialwissenschaft irina.anusca@uni-due.de
Avakian, Artjom	University of Kassel, Institute of Mechanics artjom.avakian@uni-kassel.de
Bartel, Thorsten	TU Dortmund, Institute of Mechanics thorsten.bartel@udo.edu
Böttcher, Anke	TU Darmstadt, Fachbereich Mathematik Arbeitsgruppe Analysis/ Partielle Differentialgleichungen aboettcher@mathematik.tu-darmstadt.de
Brands, Dominik	Universität Duisburg-Essen, Fakultät Ingenieurwissenschaften, Abteilung Bauwissenschaften, Institut für Mechanik dominik.brands@uni-due.de
Buckmann, Karsten	TU Dortmund, Institute of Mechanics karsten.buckmann@tu-dortmund.de
Carman, Gregory P.	University of California, Los Angeles, Department of Mechanical and Aerospace Engineering, TANMS carman@seas.ucla.edu
Denzer, Ralf	TU Dortmund, Institute of Mechanics ralf.denzer@tud.edu
Dkhil, Brahim	Ecole Centrale Paris, Laboratoire Structures, Propriétés, Modélisation des Solides brahim.dkhil@ecp.fr
Dörr, Kathrin	MLU Halle-Wittenberg, Institute for Physics kathrin.doerr@physik.uni-halle.de
Dulkin, Evgeniy	The Hebrew University of Jerusalem, Department of Applied Physics evgeniy.dulkin@mail.huji.ac.il
Dusthakar, Dinesh Kumar	TU Dortmund, Institute of Mechanics dinesh.dusthakar@tu-dortmund.de
Endres, Florian	Friedrich-Alexander Universität Erlangen-Nürnberg, Lehrstuhl für Technische Mechanik florian.endres@ltm.uni-erlangen.de

Ethiraj, Gautam	University of Stuttgart, Institute of Applied Mechanics (CE), Chair I gautam.ethiraj@mechbau.uni-stuttgart.de
Gellmann, Roman	Universität Kassel, Institut für Mechanik gellmann@uni-kassel.de
Gross, Dietmar	TU Darmstadt, Division of Solid Mechanics gross@mechanik.tu-darmstadt.de
Hossain, Mokarram	Friedrich-Alexander Universität Erlangen-Nürnberg, Lehrstuhl für Technische Mechanik mokarram.hossain@ltm.uni-erlangen.de
Kabel, Matthias	Fraunhofer-Institut für Techno- und Wirtschaftsmathematik (ITWM), matthias.kabel@itwm.fraunhofer.de
Kamlah, Marc	Karlsruhe Institute of Technology, Institut für Angewandte Ma- terialien - Werkstoff- und Biomechanik Marc.kamlah@kit.edu
Keip, Marc-Andre	University of Stuttgart, Institute of Applied Mechanics (CE), Chair I keip@mechbau.uni-stuttgart.de
Kiefer, Bjoern	TU Dortmund, Institute of Mechanics bjoern.kiefer@udo.edu
Klinkel, Sven	RWTH Aachen, Lehrstuhl für Baustatik und Baudynamik klinkel@lbb.rwth-aachen.de
Kraynyukova, Natalya	TU Darmstadt, Fachbereich Mathematik Arbeitsgruppe Analy- sis/ Partielle Differentialgleichungen Kraynyukova@mathematik.tu-darmstadt.de
Kuhn, Charlotte	University of Kaiserslautern, Department of machinery and pro- cess engineering, Chair of Applied Mechanics chakuhn@rhrk.uni-kl.de
Kuna, Meinhard	TU Bergakademie Freiberg, Institut für Mechanik und Fluidy- namik Meinhard.Kuna@imfd.tu-freiberg.de
Labusch, Matthias	Universität Duisburg-Essen, Fakultät Ingenieurwissenschaften, Abteilung Bauwissenschaften, Institut für Mechanik matthias.labusch@uni-due.de
Lange, Stephan	University of Kassel, Institute of Mechanics stephan.lange@uni-kassel.de

Lupascu, Doru C.	Universität Duisburg-Essen, Institut für Materialwissenschaft und Center for Nanointegration Duisburg-Essen (CENIDE) doru.lupascu@uni-due.de
Mahnken, Rolf	Universität Paderborn, Fakultät für Maschinenbau, Lehrstuhl für Technische Mechanik rolf.mahnken@ltm.upb.de
McMeeking, Robert M.	University of California, Santa Barbara, Department of Mechanical and Environmental Engineering rmcm@engineering.ucsb.edu
Menzel, Andreas	TU Dortmund, Institute of Mechanics andreas.menzel@udo.edu
Miehe, Christian	University of Stuttgart, Institute of Applied Mechanics (CE), Chair I christian.miehe@mechbau.uni-stuttgart.de
Müller, Ralf	University of Kaiserslautern, Department of Machinery and Process Engineering, Chair of Applied Mechanics ram@rhrk.uni-kl.de
Nazrabi, Ahamdshah	Universität Duisburg-Essen, Institut für Materialwissenschaft ahmadshah.nazrabi@uni-due.de
Quandt, Eckhardt	Christian-Albrechts-Universität zu Kiel, Technische Fakultät der CAU, Anorganische Funktionsmaterialien eq@tf.uni-kiel.de
Ricoeur, Andreas	University of Kassel, Institute of Mechanics andreas.ricoeur@uni-kassel.de
Schneider, Matti	TU Chemnitz, Fakultät für Maschinenbau, Professur Strukturleichtbau und Kunststoffverarbeitung matti.schneider@mb.tu-chemnitz.de
Schrade, David	University of Kaiserslautern, Department of Machinery and Process Engineering, Chair of Applied Mechanics schrade@rhrk.uni-kl.de
Schröder, Jörg	Universität Duisburg-Essen, Fakultät Ingenieurwissenschaften, Abteilung Bauwissenschaften, Institut für Mechanik j.schroeder@uni-due.de
Soergel, Elisabeth	Universität Bonn, Physikalisches Institut soergel@uni-bonn.de
Spieler, Christian	TU Dresden, Institut für Festkörpermechanik, Professur für Nichtlineare Festkörpermechanik christian.spieler@tu-dresden.de

Stark, Sebastian	TU Dresden, Institut für Festkörpermechanik, Professur für Mechanik multifunktionaler Strukturen sebastian.stark@tu-dresden.de
Starke, Gerhard	Universität Duisburg-Essen, Fakultät für Mathematik gerhard.starke@uni-due.de
Svendsen, Bob	RWTH Aachen, Lehrstuhl für Werkstoffmechanik bob.svendsen@rwth-aachen.de
Tanaka, Masato	Toyota Central R&D Laboratories, Inc. tanamasa@mosk.tytlabs.co.jp
Thai, Huy Ngoc	Universität Duisburg-Essen, Fakultät Ingenieurwissenschaften, Abteilung Bauwissenschaften, Institut für Mechanik huy.thai@uni-due.de
Valicotti, Daniel	University of Stuttgart, Institute of Applied Mechanics (CE), Chair I daniel.vallicotti@mechbau.uni-stuttgart.de
Walter, Bastian	Friedrich-Alexander Universität Erlangen-Nürnberg, Lehrstuhl für Technische Mechanik bastian.walter@ltm.uni-erlangen.de
Wang, Zhibin	University of Kassel, Institute of Mechanics bzhiwang@gmail.com
Webber, Kyle	TU Darmstadt, Fachbereich Materialwissenschaften, FG Nichtmetallisch-Anorganische Werkstoffe webber@ceramics.tu-darmstadt.de
Weinberg, Kerstin	Universität Siegen, Fakultät IV, Department Maschinenbau, Institut für Mechanik und Regelungstechnik – Mechatronik, Arbeitsgruppe Festkörpermechanik kerstin.weinberg@uni-siegen.de
Wende, Heiko	Universität Duisburg-Essen, Fakultät für Physik heiko.wende@uni-due.de
Wingen, Marius	University of Kassel, Institute of Mechanics mariuswingen@web.de
Yi, Min	TU Darmstadt, Material- und Geowissenschaften, Mechanik Funktionaler Materialien yi@mfm.tu-darmstadt.de
Zuo, Yinan	TU Darmstadt, Material- und Geowissenschaften, Mechanik Funktionaler Materialien zuo@mfm.tu-darmstadt.de