Prof. Wolfgang **Rheinheimer**

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Professional Experience

Since January 2018	**Assistant Professor**, School of Materials Engineering, Purdue University, USA

January 2016 – December 2017	**Group leader,** Institute of Applied Materials – Ceramics in Mechanical Engineering (Prof. Dr. Michael J. Hoffmann), Karlsruhe Institute of Technology, Germany
	Research Internets:
	• Fundamentals of microstructural evolution of perovskite ceramics
	  ○ Impact of electric fields
	  ○ Impact of defect chemistry
	  ○ Atomic grain boundary structure
	• Synthesis, sintering and electrical properties of perovskite ceramics
	• Solid state single crystal conversion

April 2013 – December 2015	**Postdoc** in cooperation with Robert Bosch GmbH, Institute of Applied Materials – Ceramics in Mechanical Engineering (Prof. Dr. Michael J. Hoffmann), Karlsruhe Institute of Technology, Germany Research Internets: • Electromechanical characterization of ferroelectric actuators (PZT) • Sintering of PZT multilayer actuators with control of PbO evaporation and its correlation to electromechanical performance • Flash sintering of PZT multilayer actuators
April 2013	**Doctorate (**Dr.-Ing.**),** Institute of Applied Materials – Ceramics in Mechanical Engineering (Prof. Dr. Michael J. Hoffmann), Karlsruhe Institute of Technology, Germany Title: *Interfacial Anisotropy of $SrTiO_3$ ('Zur Grenzflächenanisotropie von $SrTiO_3$')* • Measurement of the anisotropy of the grain boundary mobility • Measurement of the anisotropy of the surface energy • Diffraction Contrast Tomography on 4D grain growth in perovskite ceramics • Modelling of anisotropic grain boundary migration
April 2010 – April 2013	**Research associate**, Institute of Applied Materials – Ceramics in Mechanical Engineering (Prof. Dr. Michael J. Hoffmann), Karlsruhe Institute of Technology, Germany
August 2009 – March 2010	**Research assistant**, Institute of Applied Materials – Ceramics in Mechanical Engineering (Dr. Michael Bäurer, Dr. Thomas Waschkies), Karlsruhe Institute of Technology, Germany Tasks: Electrical measurement techniques, design, construction and programming of electric measurement equipment, research on ceramic semiconductors and Schottky barriers
June 2009 – November 2009	**Diploma thesis,** Institute of Applied Materials – Ceramics in Mechanical Engineering (Prof. Dr. Michael J. Hoffmann), Karlsruhe Institute of Technology, Germany Title: 'Impedance spectroscopy on Schottky barriers in strontium titanate: origin of resistive switching behavior'
October 2007 – April 2008	**Internship,** Daimler AG, Mannheim, Germany Task: quality management of the production of diesel engines for trucks

October 2003 – November 2009	**School of industrial engineering**, Karlsruhe Institute of Technology, Diplom Main focus: Material Science, automotive engineering, quality management
Since 2003	Volunteer of the civil protection (Bundesanstalt Technisches Hilfswerk)
1994 – 2003	**Secondary school**, Theodor-Heuss-Gymnasium, Ludwigshafen, Germany Award for excellent skills in Physics

Publications

16 articles in peer-reviewed journals and 1 patent, h-index of 6

Papers

F. Lemke; W. Rheinheimer & M. J. Hoffmann: "A comparison of power controlled flash sintering and conventional sintering of strontium titanate", Scripta Materialia, 2017, 130, 187-190

W. Rheinheimer, Fabian J. Altermann & M. J. Hoffmann: 'The equilibrium crystal shape of strontium titanate: Impact of donor doping', Scripta Materialia, 2017, 127, 118 - 121

W. Rheinheimer & M. J. Hoffmann: 'Grain growth in perovskites: Current Opinion in Solid State and Materials Science, 2016, 20, 286 - 298

W. Rheinheimer; M. Fülling & M. J. Hoffmann: 'Grain growth in weak electric fields in strontium titanate: Grain growth acceleration by defect redistribution ', Journal of the European Ceramic Society, 2016, 36, 2773 - 2780

F. Lemke, W. Rheinheimer & M. J. Hoffmann: 'Sintering and grain growth in $SrTiO_3$: impact of defects on kinetics', Journal of Ceramic Society of Japan, 2016, 124, 346-353

J. Hötzer, V.Rehn, W. Rheinheimer, M. J. Hoffmann, & B. Nestler: 'Phase-field study of pore-grain boundary interaction', Journal of Ceramic Society of Japan, 2016, 124, 329-339

W. Rheinheimer, M. Bäurer, H. Chien, G. S. Rohrer, C. A. Handwerker, J. E. Blendell & M. J. Hoffmann: 'The equilibrium crystal shape of strontium titanate and its relationship to the grain boundary plane distribution', Acta Materialia, 2015, 82, 32-40

W. Rheinheimer, M. Bäurer, C. A. Handwerker, J. E. Blendell, & M. J. Hoffmann: 'Growth of single crystalline seeds into polycrystalline strontium titanate: Anisotropy of the mobility, intrinsic drag effects and kinetic shape of grain boundaries', Acta Materialia , 2015, 95, 111 – 123

W. Rheinheimer, M. Bäurer, & M. J. Hoffmann: 'A reversible wetting transition in strontium titanate and its influence on grain growth and the grain boundary mobility', Acta Materialia, 2015, 101, 80-89

W. Rheinheimer & M. J. Hoffmann: 'Grain growth transitions of perovskite ceramics and their relationship to abnormal grain growth and bimodal microstructures', Journal of Materials Science, 2015, HTC 2015, 1-10

W. Rheinheimer & M. J. Hoffmann: 'Non-Arrhenius behavior of grain growth in strontium titanate: New evidence for a structural transition of grain boundaries', Scripta Materialia, 2015, 101, 68-71

H. Sternlicht, W. Rheinheimer, M. J. Hoffmann, & W. D. Kaplan: 'The mechanism of grain boundary motion in $SrTiO_3$', Journal of Materials Science, 2015, 51, 467-475

M. Syha, W. Rheinheimer, B. Lödermann, A. Graff, A. Trenkle, M. Bäurer , D. Weygand, W. Ludwig, P. Gumbsch: 'Three dimensional X-ray Diffraction Contrast Tomography Reconstruction of Polycrystalline Strontium Titanate during Sintering and Electron Backscatter Diffraction Validation', 2nd World Congress on Integrated Computational Materials Engineering, 2013

M. Syha, W. Rheinheimer, M. Bäurer, E. M. Lauridsen, W. Ludwig, D. Weygand, P. Gumbsch: ' Three-dimensional grain structure of sintered bulk strontium titanate from X-ray diffraction contrast tomography', Scripta Materialia, 2012

M. Syha, M. Bäurer, W. Rheinheimer, W. Ludwig, E. M. Lauridsen, D. Weygand, P. Gumbsch: 'Combining X-Ray Diffraction Contrast Tomography and Mesoscale Grain Growth Simulations in Strontium Titanate: An Integrated Approach for the Investigation of Microstructure Evolution", Developments in Strategic Materials and Computational Design III, 2012

M. Syha, W. Rheinheimer, M. Bäurer, E. M. Lauridsen, W. Ludwig, D. Weygand, P. Gumbsch: 'Interface Orientation Distribution during Grain Growth in Bulk $SrTiO_3$ Measured by Means of 3D X-Ray Diffraction Contrast Tomography", MRS Proceedings, 2012

Patent

W. Rheinheimer & M. Bäurer: 'Electronic component and its use', European Patent No. EP 2 388 824 A2, 2011

Reviewing activity

- Scripta Materialia
- Crystal Growth & Design
- Current Opinion in Solid State and Materials Science
- Journal of the American Ceramic Society
- Journal of the European Ceramic Society
- Journal of the Asian Ceramic Society
- Journal of Physical Chemistry
- Nanoscale
- Journal of Materials Chemistry C
- Materials (MDPI)
- Ceramics International
- Journal of Materials Research

Conference Contributions

More than 60 conference contributions on international conferences
More than 15 invited and keynote talks

Invited and keynote talks

W. Rheinheimer, C. Krill III & M.J. Hoffmann: 'Grain growth in ceramics: a mean field perspective', Ceramic Microstructure Evolution: Fundamentals and Characterization Techniques (ACerS Basic Science Division Tutorial at EMA), 2017

W. Rheinheimer, E. Schoof, M. Selzer, B. Nestler & M.J. Hoffmann: ‚Anti-thermal grain growth in perovskite ceramics', PACRIM, 2017

W. Rheinheimer, J. Preusker; J.P. Parras, R.A. de Souza & M.J. Hoffmann: 'Grain growth in electric field in perovskites: defects, space charge and their impact on boundary migration', MS&T, 2017

H. Sternlicht; W. Rheinheimer; A. Mehlmann; A. Rothshild; M.J. Hoffmann & W. D. Kaplan : "Disconnections at general grain boundaries in $SrTiO_3$ and their role in grain boundary motion", EMA, 2017

W. Rheinheimer & M. J. Hoffmann: 'Grain growth transitions in perovskite ceramics', MS&T, 2016

W. Rheinheimer, F. Lemke & M. J. Hoffmann: 'Impact of space charge on grain growth in perovskite ceramics: growth stagnation, solute drag and intrinsic defects', EMA, 2016

P. Gumbsch, A. Trenkle, M. Syha, M. Echlin, W. Lenthe, T.M. Pollock, W. Rheinheimer, M.J. Hoffmann, D. Weygand & W. Ludwig: 'Time Resolved 3D Diffraction Contrast Tomography Imaging of Grain Growth in Strontium-Titanate', MRS 2016 spring meeting, 2016

M.J. Hoffmann, H. Kungl, M. Oldenkotte, W. Rheinheimer, M. Hinterstein, G. Picht: 'Microstructural Impact on the Electro-mechanical Behaviour of Ferroelectric Ceramics Based on PZT', International Workshop on Ceramic Interfaces, Jeju Island, 2015

W. Rheinheimer, M. Bäurer & M. J. Hoffmann: 'Grain growth anomalies in Strontium and Barium Titanate and its relationship to abnormal grain growth and defect distribution', EMA, 2015

W. Rheinheimer, C. A. Handwerker; J. E. Blendell & M. J. Hoffmann: 'Grain boundary mobility of strontium titanate: Anisotropy, intrinsic drag effects and kinetic shapes of grain boundaries', MS&T, 2015

W. Rheinheimer & M. J. Hoffmann: 'Grain growth transitions in perovskites', Workshop on Interfaces, Bear Creek, 2015

W. Rheinheimer, M. Bäurer, M. J. Hoffmann: 'Microstructure evolution in Perovskite Ceramics: wetting, abnormal grain growth and the use of classical grain growth modelling', PACRIM, 2015

W. Rheinheimer, M. Bäurer, M. J. Hoffmann: 'Grain growth anomalies in Strontium and Barium Titanate Ceramics and their relationship to abnormal grain growth', Sintering, 2014

W. Rheinheimer, M. Bäurer & M. J. Hoffmann: 'Grain growth in perovskite ceramics: New evidence for a structural grain boundary transition', MS&T, 2014

M. Bäurer, W. Rheinheimer & M. J. Hoffmann: 'Microstructural characterization and control of perovskites', ICCPS - 12th International Conference on Ceramic Processing Science, 2013

W. Rheinheimer, M. Bäurer & M. J. Hoffmann: 'Microstructural Evolution in Perovskite Ceramics', Electronic Materials and Applications (EMA), 2013

Meeting Organization

Symposium 'Interfaces in microstructural evolution of functional materials: Structure, properties, anisotropy and modelling', Wolfgang Rheinheimer, Klaus van Benthem, John E. Blendell, Material Science and Engineering, (MSE), 2018

Symposium 'Sintering and Related Powder Processing Science and Technologies', Ricardo H. R. Castro, Zachary Cordero, Eugene A. Olevsky, Wolfgang Rheinheimer, Material Science and Technology (MS&T), 2018

'Basic Science Division Tutorial: Defect chemistry in perovskite ceramics and its impact on materials processing and properties', Electronic and Advanced Materials (EAM), 2018

Member of the Scientific Committee of the 7th International Congress on Ceramics (ICC7), 2018

Symposium 'Characterization and modeling of ceramic interfaces: structure, bonding, and grain growth', Klaus van Benthem, Wolfgang Rheinheimer, Sung-Yoon Chung, Jian Luo and Katsuyuki Matsunaga, 12th Pacific Rim Conference on Ceramic and Glass Technology (PACRIM), 2017

Symposium 'Robert B. Sosman Award Symposium: Tailoring ceramic microstructures: Understanding and tuning of materials performance', Wolfgang Rheinheimer, MS&T, 2017

Symposium 'Interfaces in Microstructural Evolution: Structure, Properties, Anisotropy, and Motion', Wolfgang Rheinheimer, John E. Blendell and Michael J. Hoffmann, Electronic Materials and Applications (EMA), 2017

Symposium 'Processing and microstructure of functional ceramics: Sintering, grain growth and their impact on the materials properties', Wolfgang Rheinheimer, John E. Blendell and Michael J. Hoffmann, EMA, 2016

Teaching

Graduate teaching

'Functional Ceramics'

Undergraduate teaching

'Transport phenomena'

'Material Science for Industrial Engineering I' (exercise class)

'Material Science for Industrial Engineering II' (exercise class)

Laboratory course for mechanical/industrial Engineering: 'Technical Ceramics'

Leadership and Professional Affiliations

Responsibility and supervision of 2 PhD students and more than 10 undergraduate students (Bachelor program) and graduate students (Master program)

Organization of 6 symposia in the frame of international conferences (EMA, MA&T, PACRIM, MSE and ICC)

Member of the American Ceramic Society (ACerS)

- Mentor of the PCSA (since 2017)
- Program chair of the Basic Science Division (since 2016)
- BSD Long Range Programming Committee (since 2017)
- Sosman Award Committee (since 2017)
- President's Council of Student Advisors (PCSA, 2013-2014)

Member of the Deutsche Gesellschaft für Materialforschung (DGM)

Fundraising

'The Mechanism of Grain Boundary Motion', (Grant No. I-1276-401.10/2014), German-Israeli Foundation for Scientific Research and Development, in cooperation with Wayne D. Kaplan (Technion, Haifa) and Michael J. Hoffmann (KIT, Germany), 2013, **€200.000**

'Simulation and Microstructure of Polycrystals', Graduate School funded by the state of Baden-Württemberg, Germany, 2015, **€53.000**

'Impact of electric fields on grain growth in strontium titanate', German Research Foundation (DFG), in cooperation with Matous Mrovec and Michael J. Hoffmann (KIT, Germany), 2016, **€700.000**)

References

Gregory S. Rohrer, Carnegie Mellon University, USA
Carol A. Handwerker, Purdue, USA
John E. Blendell, Purdue, USA
Gary L. Messing, Pennsylvania State University, USA
Klaus van Benthem, UC Davis, USA
Martin P. Harmer, Lehigh, USA
Ivar E. Reimanis, Colardo School of Mines, USA
Suk-Joong L. Kang, KICET, Korea
Wayne D. Kaplan, Technion, Israel
Mehmet A. Gülgün, Sabanci, Turkey
Michael J. Hoffmann, KIT, Germany
Britta Nestler, KIT, Germany
Peter Gumbsch, Fraunhofer IWM, Germany
Jürgen Rödel, TU Darmstadt, Germany
Carl Krill III, University of Ulm, Germany