

PROFESSIONAL SKETCH

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Education

Musikhochschule Rheinland, Music, 1983-84
RWTH Aachen, Physical Metallurgy and Metal Physics, Diplom, summa cum laude, 1984-1990
RWTH Aachen, Physical Metallurgy and Metal Physics, Dr.-Ing., summa cum laude, 1990-1992
RWTH Aachen, Physical Metallurgy and Metal Physics, Habilitation, 1992-1997

Main Awards, Honors, Memberships

Borchers Award, University Aachen RWTH
Adolf-Martens Award, BAM Berlin
Friedrich-Wilhelm Award, University Aachen RWTH
Best - Paper Award, Steel Research 1995
Masing Award, German Society for Materials Science DGM
Young Scientist and Engineer Award, ICOTOM
Heisenberg Scholarship, German Research Foundation DFG
Materials Science and Technology Prize, Federation of European Materials Science Societies FEMS
Dr. Meyer-Struckmann Award, University Cottbus
Gottfried Wilhelm Leibniz Award, German Research Foundation DFG
Elected as Nr. 1 among the TOP-10 of German Scientists below the age of 45
Lee Hsun Lecture Award of the Chinese Academy of Sciences, 2008
Member of Council of Science and Humanities of the German Government (Wissenschaftsrat since 2010
Weinberg Lecture Award, University of British Columbia, Vancouver, 2011
DGM Award (Award of the German Society for Materials Science), 2011
ERC Advanced Grant, 2012
Member Northrhine-Westfalian Academy of Sciences
Member National Academy Leopoldina
Honorary Professor, Katholieke Universiteit Leuven, 2014

Employment

Professor (APL), RWTH Aachen
since 2010 Cief Executive Max-Planck-Institut für Eisenforschung GmbH
since 1999 Director and Department Head at the Max-Planck-Institut für Eisenforschung GmbH and
Scientific Member of the Max-Planck-Society
1997 -1999 Scientist at the Department for Materials Science and Engineering, Carnegie Mellon
University, Pittsburgh, USA
and
Scientist at the US National High Magnetic Field Laboratory, Tallahassee, Florida USA

1992-97 Scientist and group leader, RWTH Aachen

Service Activities (selected)

Member of Selection Board of scholarship programme of Alexander von Humboldt Foundation (since 2007)

Member of Governors Board of Acta Materialia Inc. (2007-2014)

Member of Council of Science and Humanities of the German Government (Wissenschaftsrat) (since 2010)

Member of Materials Science and Engineering Expert Committee of the European Science Foundation (ESF) (since 2008)

Member and Chairman of Board of Governors (Hochschulrat) of RWTH Aachen University (since 2012)

Scientific Interests and Mission

Raabe works on the simulation and mechanical properties of metallic alloys. He wrote and edited several books on this topic, e.g. 'Computational Materials Science' (1998), 'Continuum Scale Simulation of Engineering Materials' (2005), and 'Crystal Plasticity FEM in Materials Science and Engineering' (2010) as well as more than 400 peer reviewed publications (>9500 ISI cites, ISI H-factor 50). Raabe places emphasis on comparing simulations with experiments conducted under complex boundary conditions. Currently, he works on the integration of quantum mechanical simulations into engineering materials design and property predictions. This changes computational materials science from a descriptive into a predictive method. A special feature of the approach is that atomistic simulations are combined with atomic scale characterization. The common vision of these activities is the use of predictive simulations and their consequent engineering application for inventing advanced alloys. The aim is the physically-based design of materials with superior properties (strength, elongation, damage tolerance) for the fields of energy, mobility and health from the atomic to the macro-scale under consideration of synthesis and processing. The blend of theory, characterization, and processing is important in his approach. Raabe is a frequent plenary and keynote speaker. In 2004 he received the highest German research award (Leibniz-Award). 2008 he was awarded Lee Hsun Lecture Award of the Chinese Academy of Sciences and in 2011 the Weinberg Lecture Award of the University of British Columbia. In 2012 he received an ERC advanced grant, which is the largest single-researcher grant in Europe. Raabe mentored more than 55 Ph.D.s, many of whom now hold leading positions in companies and academia as faculty members in the US, UK, and Asia. Since 2010 he is a member of the German Council of Science and Humanities (Wissenschaftsrat). He is a member of the National Academy Leopoldina and Honorary Professor at the Katholieke Universiteit in Leuven.

Some recent important publications

1. S. Mandal, S. Lang, M. Gross, M. Oettel, D. Raabe, T. Franosch, F. Varnik, Multiple reentrant glass transitions in confined hard-sphere glasses, *Nature Communications*, **5** (2014) 4435
2. M.J. Duarte, J. Klemm, S. O. Klemm, K. J. J. Mayrhofer, M. Stratmann, S. Borodin, A. H. Romero, M. Madinehei, D. Crespo, J. Serrano, S. S. A. Gerstl, P. P. Choi, D. Raabe, F. U. Renner: Element-Resolved Corrosion Analysis of Stainless-Type Glass-Forming Steels. *Science* **341** (2013) 372-376.
3. M. Herbig, D. Raabe, Y. J. Li, P. Choi, S. Zaefferer, S. Goto: Atomic-Scale Quantification of Grain Boundary Segregation in Nanocrystalline Material: *Physical Review Letters* **112** (2014) 126103.
4. S. Mandal, M. Gross, D. Raabe, F. Varnik: Heterogeneous Shear in Hard Sphere Glasses. *Physical Review Letters* **108** (2012) 098301.
5. W. Guo, E. A. Jäggle, P.-P. Choi, J. Yao, A. Kostka, J. M. Schneider, D. Raabe, Shear-Induced Mixing Governs Codeformation of Crystalline-Amorphous Nanolaminates *Physical Review Letters* **113** (2014) 035501.
6. Y.H. Wen, H.B. Peng, D. Raabe, I. Gutierrez-Urrutia, J. Chen, Y.Y. Du, Large recovery strain in Fe-Mn-Si-based shape memory steels obtained by engineering annealing twin boundaries, *Nature Communications* **5** (2014) 4964
7. F. Roters, P. Eisenlohr, L. Hantcherli, D.D. Tjahjanto, T.R. Bieler, D. Raabe: Overview of constitutive laws, kinematics, homogenization and multiscale methods in crystal plasticity finite-element modeling: Theory, experiments, applications: *Acta Materialia* **58** (2010) 1152-1211.
8. S. Sandloebes, M. Friak, S. Zaefferer, A. Dick, S. Yi, D. Letzig, Z. Pei, L. F. Zhu, J. Neugebauer, D. Raabe, The relation between ductility and stacking fault energies in Mg and Mg-Y alloys: *Acta Materialia*, **60** (2012) 3011-3021.
9. D. Raabe, C. Sachs, P. Romano, The crustacean exoskeleton as an example of a structurally and mechanically graded biological nanocomposite material: *Acta Materialia*, **53** (2005) 4281-4292.
10. S. Nikolov, M. Petrov, L. Lymperakis, M. Friak, C. Sachs, H.-O. Fabritius, D. Raabe, J. Neugebauer, Revealing the Design Principles of High-Performance Biological Composites Using Ab initio and Multiscale Simulations: The Example of Lobster Cuticle: *Advanced Materials*, **22** (2010) 519.
11. M. Herbig, D. Raabe, Y. J. Li, P. Choi, S. Zaefferer, S. Goto, *Phys. Rev. Lett.* **112**, 126103 – Published 27 March 2014; Atomic-Scale Quantification of Grain Boundary Segregation in Nanocrystalline Material