

Curriculum Vitae

Chemical Sciences and Engineering Division
& Center for Nanoscale Materials
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Argonne National Laboratory
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I. Professional preparation

- 7/2003* Habilitation in Experimental Physics, Freie Universität Berlin, Germany
University teaching qualification (Lehrbefähigung) in Experimental Physics granted
Topic of the Habilitation Work: "Reactivity and Ultrafast Dynamics of Small Clusters and Molecules: From Analysis to Control"
- 6/1990* Ph.D. in Chemistry, Charles University, Prague, Czechoslovakia
Title of the Ph.D. thesis: "Sub-Nanosecond Spectroscopy and Dynamics of Molecular Systems"
- 10/1985* RNDr. (Rerum Naturalium Doctoris in Disciplina Chemia Physica - Doctor of Natural Sciences in Physical Chemistry, no equivalent in the USA), Charles University, Prague
- 6/1985* M.Sc. (University Diploma with Highest Distinction) in Physical Chemistry, Charles University, Prague, Czechoslovakia
Title of the diploma thesis: "Relaxation of Molecules: The Use of Iterative Convolution Method in Data Analysis"

II. Complete Professional Background

- Since 2007* Adjunct Full Professor, Department of Chemical Engineering, School of Engineering & Applied Science, Yale University
- Since 2006* Joint with the Center for Nanoscale Materials, Argonne National Laboratory
- Since 10/2007* Research Chemist, Chemical Sciences and Engineering Division, Argonne National Laboratory
- 8/2002 - 9/2007* Research Chemist, Chemistry Division, Argonne National Laboratory, Argonne, Illinois, USA
- 10/1997 - 8/2002* Research project leader and group leader at the Freie Universität Berlin
Research projects within the German National Research Center Priority Programs SFB 337 "Energy and Charge Transfer in Molecular Aggregates" and SFB 450 "Analysis and Control of Ultrafast Photoinduced Reactions"
- 10/2000 - 8/2002* University Senior Assistant (C1) at the Institute of Physics, Freie Universität Berlin, Germany
(Analysis and control of the molecular dynamics and reactivity in small metal clusters, alkali-metal clusters and organometallic molecules by employing phase- and amplitude modulated femtosecond laser pulses.)
- 10/1995 - 9/2000* Researcher at the Institute of Physics, Freie Universität Berlin, Germany
(Study of the real-time dynamics in small metal and alkali-metal clusters in molecular beams by means of femtosecond laser spectroscopy; chemical

reactions and catalytic properties of size-selected ionic metal clusters in the gas phase.)

Research group of Prof. Ludger Wöste

10/1994 - 9/1995 Researcher at the Department of Chemical Physics, Faculty of Mathematics and Physics, Charles University, Prague, (Laser Spectroscopy.)

8/1992 - 9/1994 Researcher at the Department of Physical Chemistry, Faculty of Science, Charles University, Prague, (Sub-nanosecond fluorescence spectroscopy.)

10/1991 - 7/1992 Fulbright Fellow at the Department of Chemistry, The University of Chicago, Chicago, Illinois, USA.

(Study of solvent shell relaxation in pure water and water in confined space by femtosecond, picosecond and nanosecond fluorescence spectroscopy.)

Host: Prof. Graham R. Fleming (now University of California, Berkeley and Lawrence Berkeley National Laboratory)

10/1990 Visiting scholar at the Institute of Physical Chemistry, University Göttingen, Göttingen, Germany (Study of ionic sphere relaxation.)

Research group of Prof. Jörg Schröder

12/1989 - 9/1991 Research assistant at the Department of Physical Chemistry, Faculty of Science, Charles University, Prague, Czechoslovakia
(Study of ionic sphere relaxation, study of the effect of inclusion of dye molecules into the cavity of cyclodextrins, energy transfer study in model systems by means of time-resolved spectroscopy. Software development.)
Group of Prof. V. Fidler (now joint appointment at Brown University)

III. Teaching Experience

Since 1985 Supervisor and co-supervisor of undergraduate, graduate students and postdoctoral appointees

1999 - 2002 Courses and Seminars on Atomic and Molecular Physics II
Institute of Physics, Freie Universität Berlin, Berlin, Germany
Class sizes: between 15-20

1999 - 2002 Courses and Seminars on Atomic and Molecular Physics I
Institute of Physics, Freie Universität Berlin, Berlin, Germany
Class sizes: between 30-40

1999 - 2002 Advanced and General Physics Laboratory Course for students of physics
Institute of Physics, Freie Universität Berlin, Berlin, Germany
Class sizes: between 20-40

1999 - 2002 Physics Laboratory Courses for the students of medicine
Institute of Physics, Freie Universität Berlin, Berlin, Germany
Class sizes: between 40-60

1992 - 1994 Photochemistry Course for master (diploma) students of physical chemistry
Department of Physical Chemistry, Faculty of Science, Charles University
Class sizes: between 5-10

1985 - 1994 General Physical Chemistry Laboratory Courses, Department of Physical Chemistry, Faculty of Science, Charles University
Class sizes: between 10-15

IV. Current Research Interests

- Study of size/shape/composition & function relationship at the sub-nanometer and nanometer scale
- Nanocatalysis & nanophotocatalysis
- Synchrotron X-ray characterization of nanoparticles
- Combined synchrotron X-ray and mass-spectroscopy studies of nanocatalysts under realistic reaction conditions
- Physical and chemical properties of supported size-selected metal clusters and nanoparticles
- Surface composition and morphology effects on nanoparticle properties
- Controlled assembly of nanoparticles into nanostructures
- Optical properties of clusters and nanostructures

V. Other Areas of Research Expertise

- Chemistry of size-selected clusters in the gas phase
- Femtosecond dynamics in clusters, molecules and organometallics
- Coherent control of ultrafast laser-induced processes in clusters and molecules
- Ultrafast time-resolved spectroscopy on solvated molecular systems
 - Conformational changes in macromolecules
 - Micellization of block copolymers
 - Solvation dynamics & ionic sphere relaxation
 - Energy transfer
 - Substrate binding to enzymes
- Steady state UV-VIS absorption, fluorescence and anisotropy spectroscopy
 - Polymer conformational changes
 - Organo-inorganic complexes in confined space
 - Excitation energy transfer

VI. Memberships in Professional Organizations

- American Chemical Society
- American Physical Society
- American Association for the Advancement of Science
- Catalysis Club of Chicago / North American Catalysis Society

VII. Other Professional Activities

- Member, ANL Chemical Sciences and Engineering Division, Seminar Committee, since 2007
- Member, ANL Chemistry Division, Seminar Committee, 2006-2007
- Member, ANL Chemistry Division, Safety Committee, since 2004
- Member, ANL Chemistry Division Committee for Hydrogen Economy, 2003
- Reviewer of scientific articles for:

Applied Physics Letters

Catalysis Letters

Collection of Czechoslovak Chemical Communications

Encyclopedia of Mass Spectrometry (Elsevier, Oxford)

European Physics Journal AP

European Physics Journal D

Journal of Applied Physics

Journal of the American Chemical Society

Journal of Chemical Physics

Langmuir

Physica Status Solidi
Rapid Research Letter - Wiley-VCH
Research Letters in Materials Science
Spectrochimica Acta
Science

- Reviewer of research proposals for:
 - ACS Petroleum Research Fund
 - German Science Foundation
 - US Department of Energy
 - US National Science Foundation
- Reviewer of books for:
 - Elsevier Book Series
- Member, Advisory Board of The Dekker Encyclopedia of Nanoscience and Nanotechnology, Marcel Dekker, Inc, New York, since 2008.
- NSF panel on Catalysis, 2008
- Co-organizer, 2008 PIRE International Workshop on Grand Challenges for Catalysis, Santa Barbara, 2008
- Review panel, 14th International Congress on Catalysis, Seoul, Korea, 2008
- Session chairman, 235th American Chemical Society Meeting, New Orleans, USA, 2008
- Session chairman, International Symposium on Size-Selected Clusters, Austria, 2007
- Session chairman, International Workshop on “Quantum Dynamical Concepts: From Diatomics to Biomolecules”, Dresden, Germany, 2002
- Co-organizer, SFB 450 International Workshop on “Analysis and Control of Ultrafast Photoinduced Reactions“, Berlin, Germany, 2001
- On panel in the Committee for Ph.D. Theses, University of Illinois at Chicago, since 2007
- On panel in the Committees for Diploma (M.Sc.) and Ph.D. Theses Freie Universität Berlin, 1995-2002
- On panel in the Committees for Diploma (M.Sc.) and Ph.D. Theses, Charles University Prague 1990-1995
- International collaborator, German National Research Center on Nanomaterials Research funded by the German Science Foundation
- Collaborator, The Partnership for International Research and Education at The University of California – Electron Chemistry and Catalysis at Interfaces, sponsored by NSF

VIII. Research Highlights

- Development of a unique experimental approach allowing the study of nanocluster-based catalysts at action under realistic conditions (high temperature, atmospheric pressure) by combining synchrotron X-ray scattering and mass-spectrometry. The method allows for the study of the size/composition/structure and function relationship in catalysis.
- First demonstration of the use of size-selected cluster based catalysts in a for industry highly relevant catalytic process; tested under realistic reaction conditions. The Pt₈₋₁₀ cluster based catalyst outperform all reported catalysts by up to 100 times in activity, while maintaining superb selectivity.
- Highly selective direct oxidation of propylene to propylene-oxide on size- and composition optimized size selected silver and gold cluster-based nanocatalysts
- Performing and understanding coherent laser control in small molecules and clusters
- First ultrafast studies of solvent shell relaxation in a confined space

IX. Publications & Presentations

In books and journals: more than 60 (including one in Science and two in Phys. Rev. Lett.)

Talks presented: around 80

Talks in fiscal years 2006 - 2008 (a total of 43):

- Invited talks at international conferences (USA, Europe and Asia): 13
- Contributed talks at international conferences: 6
- Other invited talks at US and EU institutes 24

X. Supervised and Co-supervised Diploma/M.Sc. Students, Ph.D. Students and Post-docs

- *Diploma Thesis - M.Sc. (co)advisories*

Former at the Freie Universität Berlin: B. Baptist (now SAP Frankfurt, Germany), F. Budzyn (unknown), C. Kaposta (post-doc, Oxford University), M. Krenz (Ph.D., FU Berlin), C. Lupulescu (named post-doc, Université Lyon, France), A. Merli (Ph.D., FU Berlin), S. Weber (Ph.D., FU Berlin), P. Wetzel (SAP Frankfurt, Germany)

Former at Charles University Prague: P. David (now entrepreneur, Bratislava, Slovakia), P. Kapusta (PicoQuant, Berlin, Germany), B. Nohova (unknown)

- *Ph.D. Thesis (co)advisories and contributions*

Current at Argonne: Y. Lei (Argonne and the University of Illinois at Chicago), Kristian Sell (Universität Rostock)

Former at the Freie Universität Berlin: A. Bartelt (ALS Berkeley), J. Hagen (Fraunhofer Institut, Freiburg), C. Lupulescu (named post-doc, Université Lyon), P. Rosendo-Francisco (Universidad Nacional Autónoma de México), L. Socaciu-Siebert (Hahn-Meitner Institut, Berlin), S. Wolf (Universität Heidelberg)

Former at Charles University Prague: K. Krijtova (now entrepreneur, Prague),

- *Post-docs advised*

Current at Argonne: S. Lee

Former at Argonne: G. Ballentine (now post-doc, Max-Planck Institute, Stuttgart), G. Tikhonov (post-doc, Arizona University at Tucson)

Former at the Freie Universität Berlin: A. Lindinger (now project and group leader, FU Berlin), S. Minemoto (researcher, Tokyo University)

XI. Language Skills

Czech, English, German, Hungarian, Russian (basics) and Slovak

XII. Former Research Support

Germany: Co-PI in National Research Centers funded at multimillion DM/Euro level by the German Science Foundation:

- SFB 337 “Energy and Charge Transfer in Molecular Aggregates“, 1995-2001
- SFB 450 “Analysis and Control of Ultrafast Photoinduced Processes“, 2001- 2002 (ongoing)

XIII. Current Research Support

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