



CHAIR OF INORGANIC AND GENERAL CHEMISTRY

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CURRICULUM VITAE

- Since 2006** University Full Professor, Chair of Inorganic and General Chemistry at the University of Erlangen-Nürnberg, Germany
- 2001 – 2005** Assistant Professor at the University of California, San Diego (UCSD), USA
- 1998 – 2000** Postdoctoral Studies at the Massachusetts Institute of Technology (MIT), Cambridge, USA
- 1995 – 1998** PhD, Max Planck Institute (MPI) for Radiation Chemistry (now MPI for Chemical Energy Conversion), Mülheim/Ruhr, Germany
- 1989 – 1995** Study of Chemistry at the Ruhr-University of Bochum (RUB), Germany; Diploma in Chemistry

OBJECTIVES

General objectives of our research are the syntheses of new chelating ligands and their reactive transition and actinide metal coordination complexes. These complexes often exhibit unprecedented coordination modes and unusual electronic structures, which result in enhanced reactivities towards small molecules of industrial and biological relevance such as H₂, H₂O, N₂, CH₄, CO, CO₂, NO_x, SO_x, O₂, O₃, P₄, As₄ etc. Whereas synthetic chemistry is at the heart of the Meyer group research, high-level spectroscopy is applied to help understand the molecular and electronic structure as well as the basis for reactivity of the newly synthesized reactive metal complexes.

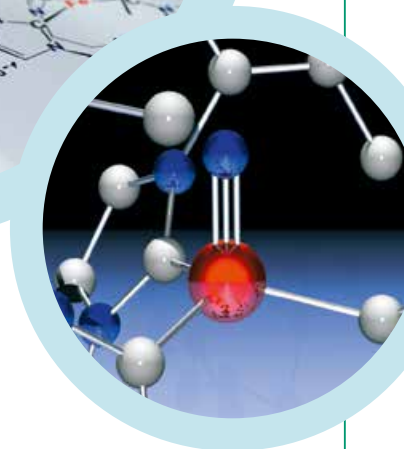
SCIENTIFIC BACKGROUND

Small molecules such as alkanes, carbon dioxide, and water are attractive natural resources for the synthesis of fine chemi-

cals and fuels. This is particularly true for the greenhouse gases CO₂ and CH₄. Functionalization of CH₄ and CO₂, however, is difficult due to their thermodynamic stabilities. One approach to circumvent this limitation is to coordinate the inert C1 molecules to a redox-active metal ion, which can serve as an electron source to reduce strong bonds. Based on the versatile reactivity of uranium and transition metal complexes it is expected that novel complexes are capable of unprecedented transformation of small molecules; thus, opening opportunities for activation and functionalization of chemical feedstock.

RESEARCH HIGHLIGHTS

The Meyer research program is focused on the activation of small molecules of biological and industrial interest using redox-active

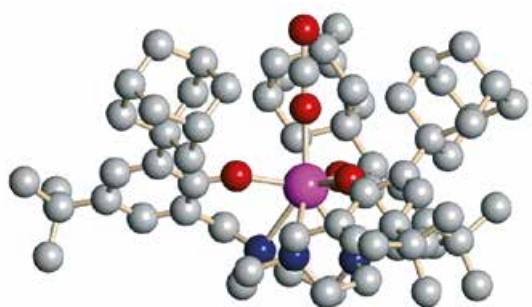


uranium and transition metal complexes in molecularly engineered ligand environments. Highlights of this work include the activation, cleavage, and multiple-bond metathesis of carbon dioxide at uranium complexes and the synthesis of reactive peroxy-, imido-, and nitrido-complexes for the functionalization of organic molecules via atom and group transfer chemistry. The series of actinide and transition metal complexes are unique as they are isostructural with varying oxidation states, e.g., Fe(II) to Fe(V) and U(II) and U(VI), enabling a complete and systematic analysis of the structure-reactivity relationships. A recent highlight is the identification of a new, previously unknown U(II) oxidation state, opening new avenues to uranium reactivity. The analysis of complex series with structural continuity through the oxidation states presents a distinct benefit for the understanding of fundamental uranium and transition metal coordination chemistry. Topics such as the nature of f-orbital covalency in uranium complexes and the role of electronic structure in coordination complex reactivity are under continuous investigation and have become trademark areas of research.

PERSPECTIVES

Ultimate long-term objectives of the fundamental synthetic research in the Meyer lab are the development of efficient catalysts for the metal complex assisted conversion of abundant natural substrate resources and the discovery of renewable energy sources.

Future research will therefore continue to focus on the advancement of novel actinide and transition metal transformations involving simple chemical feedstock, such as carbon dioxide, nitrogen, and water that are the key to sustainable energy resources.



SELECTED PUBLICATIONS

- A.-C. Schmidt, F. W. Heinemann, W. W. Lukens Jr. and K. Meyer, *J. Am. Chem. Soc.* **2014**, 136, 11980–11993
- F. Scholz, D. Himmel, F. W. Heinemann, P.v.R. Schleyer, K. Meyer and I. Krossing, *Science* **2013**, 341, 62–64
- J. J. Scepaniak, C. S. Vogel, M. M. Khusniyarov, F. W. Heinemann, K. Meyer and J. M. Smith, *Science* **2011**, 331, 1049–1052
- S. C. Bart, C. Anthon, F. W. Heinemann, E. Bill, N. M. Edelstein and K. Meyer, *J. Am. Chem. Soc.* **2008**, 130, 12536–12546
- C. Vogel, F. W. Heinemann, J. Sutter, C. Anthon and K. Meyer, *Angew. Chem. Int. Ed.* **2008**, 47, 2681–2684
- I. Castro-Rodríguez, H. Nakai, K. Meyer, *Angew. Chem. Int. Ed.* **2006**, 45, 2389–2392
- I. Castro-Rodríguez, H. Nakai, L. N. Zakharov, A. L. Rheingold, K. Meyer, *Science* **2004**, 305, 1757–1759

SELECTED REVIEWS

- H. S. La Pierre and K. Meyer, Activation of Small Molecules by Molecular Uranium Complexes, *Progress Inorganic Chemistry* **2014**, 58, 303–415
- J. Hohenberger, K. Ray and K. Meyer, The Biology and Chemistry of High-Valent Iron Oxo and Nitrido Complexes, *Nature Commun.* **2012**, 51, 781–783
- S. C. Bart and K. Meyer, Highlights in Uranium Coordination Chemistry, *Structure & Bonding* **2008**, 127, 119–176
- A. R. Fox, S. C. Bart, K. Meyer and C. C. Cummins, Towards Uranium Catalysts, *Nature* **2008**, 455, 341–349
- C. Hauser, K. Meyer, Uranchemie zwischen Phobie und Begeisterung, *Nachr. Chem.* **2007**, 55, 1195–1199
- I. Castro-Rodríguez, K. Meyer, Small Molecule Activation at Uranium Coordination Complexes: Control of Reactivity via Molecular Architecture, *Chem. Commun.* **2006**, 1353–1368

SELECTED AWARDS

- 2012 Visiting Professorship Award, Université Paul Sabatier, Toulouse, France
- 2012 Visiting Professorship Award, University of Manchester, UK (2009–2012)
- 2011 Fellow of the Royal Society of Chemistry
- 2010 Dalton Transactions European/African Lectureship Award
- 2010 Japanese Society for the Promotion of Science (JSPS) Fellowship
- 2009 Israel Chemical Society Lifetime Honorary Membership
- 2004/2005 Alfred P. Sloan Award