SELECTED PUBLICATIONS

Designing for a green chemistry future, J.B. Zimmerman, P. T. Anastas, H. Erythropel, W. Leitner, Science 2020, 367, 397-400.

Selective Catalytic Synthesis Using the Combination of Carbon Dioxide and Hydrogen : Catalytic Chess at the Interface of Energy and Chemistry, J. Klankermayer, S. Wesselbaum, K. Beydoun, W. Leitner, Angew. Chem. Int. Ed. 2016, 55, 7296-7343.

Sustainable conversion of carbon dioxide: An integrated review of catalysis and life cycle assessment, W. Leitner, A. Bardow, et al. Chem. Rev. 2018, 118, 434−504.

Direct Synthesis of Cycloalkanes from Diols and Secondary Alcohols or Ketones Using a Homogeneous Manganese Catalyst, A. Kaithal, L. L. Graria, C. Camp, E. A. Quadrelli, W. Leitner, J. Am. Chem. Soc. 2019, 141, 17487-17492.

Manganese(I)-Catalyzed β-Methylation of Alcohols Using Methanol as C1 Source, A. Kaithal, P. van Bonn, M. Hölscher, W. Leitner, Angew. Chem. Int. Ed. 2020, 59, 215-220.

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DR. WALTER LEITNER
MAX PLANCK INSTIUTE FOR CHEMICAL ENERGY CONVERSION

CATALYTIC TRANSFORMATIONS AT THE INTERFACE OF CHEMISTRY AND ENERGY: IS MANAGANESE THE BETTER RUTHENIUM?

FRIDAY, OCTOBER 2, 2020

11:30AM

MICROSOFT TEAMS

Queen's Chemistry

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Abstract

The industrial transformation of carbon- based raw materials into valuable products forms the basis of today's global economy and modern societies. With its products ranging from energy carriers through plastics and advanced materials to biologically active compounds, chemistry is essential to cope with the global challenges of our time. Moving towards a more sustainable future, there is an increasing need for broadening the raw material basis by developing and using non-fossil resources together with the deployment of carbon-free energy technologies.[1] The present contribution will discuss the opportunities and challenges of this approach and present recent progress in the development of organometallic catalysts for selected transformations.

A special emphasis will be on catalytic hydrogenation of carbon dioxide to C1 building blocks and their use in further synthetic applications.[2] While Ruthenium has been one of the most versatile metals in organometallic catalysts for such reactions, earth abundant and cheap Manganese is emerging recently as a possible alternative.[3] The mechanisms of activation and transfer of the H2 molecule will be discussed as central molecular process in these applications highlighting similarities and differences between the two metals.

[1] Designing for a green chemistry future, J. B. Zimmerman, P. T. Anastas, H. Erythropel, W. Leitner, Science 2020, 367, 397-400.

[2] a) Selective Catalytic Synthesis Using the Combination of Carbon Dioxide and Hydrogen: Catalytic Chess at the Interface of Energy and Chemistry, J. Klankermayer, S. Wesselbaum, K. Beydoun, W. Leitner, Angew. Chem. Int. Ed. 2016, 55, 7296-7343; b) Sustainable conversion of carbon dioxide: An integrated review of catalysis and life cycle assessment, W. Leitner, A. Bardow, et al. Chem. Rev. 2018, 118, 434−504.

[3] Recent examples from our laboratory: a) A. Kaithal, M. Hölscher, W. Leitner, Angew. Chem. Int. Ed. 2018, 57, 13449-13453; b) A. Kaithal, S. Sen, C. Erken, M. Hölscher, C. Werlé, W. Leitner, Nat. Commun. 2018, 9, 4521; c) O. Martínez-Ferrate, G. Franció, C. Werlé, W. Leitner, ChemCatChem. 2018, 10, 4514-4518;
d) A. Kaithal, L.L. Graria, C. Camp, E. A. Quadrelli, W. Leitner, J. Am. Chem. Soc. 2019, 141, 17487-17492
e) A. Kaithal, P. van Bonn, M. Hölscher, W. Leitner, Angew. Chem. Int. Ed. 2020, 59, 215-220.

DR. WALTER LEITNER

Walter Leitner is Director at the Max Planck Institute for Chemical Energy Conversion in Mülheim an der Ruhr and holds the Chair of Technische Chemie und Petrolchemie at RWTH Aachen University. He is also Scientific Director of CAT, the joint Catalytic Center of RWTH Aachen and the company Covestro.

His research focusses on a molecular approach to catalysis motivated by the principles of Green Chemistry. From 2004 - 2016, he served first as Scientific Editor and later as Chairman of the Editorial Board of the Journal "Green Chemistry", published by the Royal Society of Chemistry (UK) and since 2018 he is a member of the Editorial Board of "Angewandte Chemie".

The research efforts of his team have been recognized with several awards including most recently the binational Georg Wittig-Victor Grignard Prize of the French and German Chemical Societies in 2020. In 2019 he has been nominated as team member among the finalists for the Deutsche Zukunftspreis (together with Dr. Christoph Gürtler and Dr. Berit Stange, Covestro AG).

Contact

Address:
Prof. Dr. Walter Leitner
Director, Department of Molecular Catlysis, Max Planck Institute for Chemical Energy Conversion (MPI CEC), Stiftstr, 34-36, 4570 Mülheim an der Ruhr, Germany

Email: walter.leitner@cec.mpg.de
Web Page: cec.mpg.de/en/research/molecular-catalysis/prof-dr-walter-leitner/

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