



Breaking Strong Bonds and Recovering Rare Earths: Adventures in Sustainable Chemistry



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Abstract:

Catalysis is one of the most powerful tools of green chemistry, enabling reactions with lower energy consumption and providing new pathways for bond formations. In particular, catalytically functionalizing C-H bonds (common in crude oil derived molecules) and C-O bonds (common in biomass) under mild conditions are critical reactions to enable more sustainable chemical methodologies. This presentation will showcase our recent research efforts in establishing non-directed, transition metal catalyzed C-H functionalizations and catalytic C-O bond activations through halide catalysis. Our approach aims at establishing a mechanistic understanding in order to translate this knowledge into broadly useful protocols for organic synthesis and biomass activation.

At the end of the materials lifecycle, inventing new technologies to provide sustainable sources of raw materials through recycling is another critical challenge for the movement towards a circular economy. Our efforts in this area take an approach similar to our developments in the area of catalysis: Based on understanding principles and mechanisms of materials flows, we use the principles of green chemistry to enable the design of novel, sustainable rare earth recovery technologies.

Bio:

Marion Emmert received her Diploma degree in chemistry at the University of Freiburg (Germany), where she carried out research in the laboratory of Professor Bernhard Breit. She pursued her Ph.D. at the University of Munster (Germany), working with Professor Gerhard Erker. After postdoctoral work at the University of Michigan with Professor Melanie Sanford as a DFG (German Research Foundation) and NSF CCI CENTC postdoctoral fellow, she joined the faculty at Worcester Polytechnic Institute, MA in the summer of 2011 as Assistant Professor of Chemistry, with a joint appointment in the Department of Mechanical Engineering since 2012 and in the Department of Chemical Engineering since 2013.

Research in the Emmert group focuses on the development of new, sustainable processes. The group is developing transition-metal catalyzed, non-directed C-H bond functionalizations, catalysts for biomass deconstruction, and recycling processes for critical rare earth materials.

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