

From Photocatalysis to Group Transfer: Enabling New Reactivity for Earth Abundant Metals

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In recent years, there has been a renewed focus on the fundamental chemistry of earth-abundant metals and their applications in catalysis. Matching or even surpassing the remarkable activity and selectivity of well-established precious metal catalysts based on palladium, rhodium, or ruthenium has proven a major challenge due to the different electronic structures of precious versus base metals. The potential benefits of using earth-abundant metals are far-reaching and include significantly reduced cost of catalytic processes, resource availability for large scale applications, and often reduced toxicity or improved biocompatibility due to their presence (or even essential role) in the biosphere. This presentation will highlight the Milsmann group's efforts to make use of the unique electronic properties of a variety of earth-abundant elements.

The first part of the talk will focus on the development of new photoluminescent materials based on early transition metals and main group metalloids. Our results show that these complexes can not only replace precious metal photosensitizers in photoredox catalytic reactions but may exhibit optical properties that complement or surpass those of traditional late metal compounds.

As a second topic, the photochemical generation of low valent zirconium intermediates will be discussed. The high reactivity of these species can be utilized in unprecedented organometallic transformations.

The final section of the presentation will highlight the utility of iron and vanadium complexes with Fe=E or V=E (E = NR or CR₂) multiple bonds in nitrene and carbene group transfer reactions. A particular focus in this area is the careful control over different ground state configurations through ligand design and their influence on the reactivity of the resulting complexes.

Date: Wed, Nov. 20, 2019

Time: 4:30-5:30 pm

Location: 208 Clark Hall