Photochemistry and Reactivity of a series of mono- and bimetallic Mabiq complexes

Abstract: Research in the Hess lab is focused on the development of late first-row transition metal catalysts for energy related chemistry. As part of these efforts, we have generated a series of mono- and bimetallic complexes coordinated by a macrocyclic biquinazoline ligand (Mabiq). The ligand has several distinguishing features that include the ability to ligate two metal ions, redox-active functionalities, and unique photochemical properties. The resultant metal-Mabiq compounds can adopt a wide range of oxidation states and exhibit unique electronic structures. H₂ evolution and photoredox catalysis by the complexes also will be presented.

Ti-Catalyzed Nitrene Transfer Reactions: Harnessing the TiII/TiIV Redox Couple for New Organic Methods

Abstract: Titanium is an ideal metal for green and sustainable catalysis—it is the 2nd most earth-abundant transition metal, and the byproducts of Ti reactions (TiO₂) are nontoxic. However, a significant challenge of utilizing early transition metals for catalytic redox processes is that they typically do not undergo facile oxidation state changes because of the thermodynamic stability of their high oxidation states. We have recently discovered that Ti imidos (LnTi=NR) can catalyze oxidative nitrene transfer reactions from diazenes via a TiII/TiIV redox couple, and are using this new mode of reactivity to develop a large suite of practical synthetic methods. In this talk, our latest synthetic and mechanistic discoveries related to Ti nitrene transfer catalysis will be discussed, including new synthetic methods for the modular, selective construction of pyrroles via [2+2+1] cycloaddition of alkynes with Ti nitrenes and alkynes, as well as new methods for catalytic oxidative carboamination of other unsaturated organics by Ti nitrenes.

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