

## Modern Alchemy: Catalysis with Base Metals

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Transition metal catalyzed reactions have revolutionized the art of chemical synthesis. Unprecedented selectivity and new types of bond constructions have elevated metal-mediated reactions to one of the most powerful tools in the synthetic organic chemists' toolbox. Often times, these reactions rely on second and third row metals such as Pt, Pd, Rh, and Ir, which are expensive, toxic and volatile supplies. Research in our laboratory has focused on developing environmentally compatible, inexpensive and Earth abundant base catalysts of iron, cobalt and manganese as replacements for precious metals. One of the challenges is developing the two-electron chemistry required for oxidative addition and reductive elimination reactions from inherently one-electron platforms. Redox-active bis(imino)pyridine ligands have been used successfully to accomplish this objective as electron transfer chemistry can occur at both the ligand and the first row transition metal. Many of the resulting base metal compounds are active for olefin hydrogenation, hydrosilylation and various olefin cyclization reactions. One example of an industrially relevant silicone synthesis is shown below. In certain instances, this control of electronic structure has enabled new catalytic reactions that are unique to the base metals and do not find precedent with their heavy metal congeners.



**Current Platinum Catalyst**



**Iron Catalysis**

My lecture will focus on the synthesis of new iron and cobalt catalysts and the physical inorganic spectroscopic tools used to characterize redox-activity. The importance of metal ligand cooperativity and its impact on catalysis and reactivity will be discussed and commercial applications of our work will also be highlighted.