

Discovery and Understanding of Transition Metal Catalyzed Reactions

John F. Hartwig, Kenneth L. Rinehart Jr. Professor of Chemistry

Department of Chemistry, University of Illinois, 600 South Matthews Av, Urbana, IL 61801

E-mail: jhartwig@illinois.edu

Complexes of transition metals catalyze many of the new reactions used for the advancement of medicine, materials and energy utilization. For these applications, my group has sought to develop new catalytic chemistry that rests upon fundamentally new organometallic chemistry. We gain mechanistic information to explain the limits on reaction scope and to make rational choices when seeking to create improved catalysts. As a result of this work, we developed catalytic cross-coupling reactions that form aromatic amines, ethers, and sulfides and isolated amide, alkoxide, and thiolate complexes that undergo carbon-heteroatom bond formation during the catalytic process.

This lecture will focus on our development of reactions that cleave C-H bond selectively. We developed reactions that functionalize alkyl and aryl C-H bonds with borane and silane reagents with selectivities and efficiencies that are useful for synthetic purposes. Much of the lecture will focus on the mechanistic basis for this unusual reactivity and the properties of the transition metal-main group bond that make these transformations possible.

