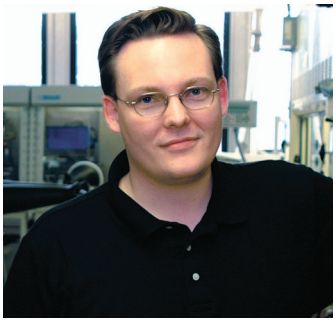

Aaron L. Odom

Organometallic/ Inorganic Synthesis and Transition Metal Catalysis in Organic Synthesis

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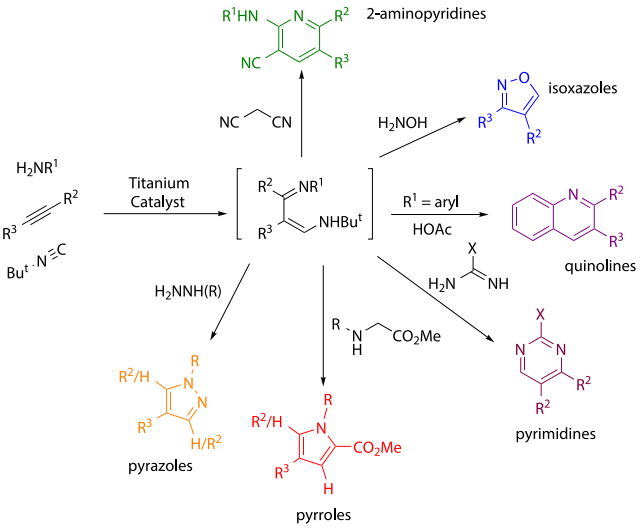
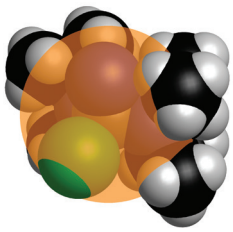
Developing sustainable and environmentally friendly approaches to products is one of the major challenges facing chemists. Some important developing methodologies for producing target compounds in fewer steps with less waste are catalyzed multicomponent coupling reactions, which allow access to structurally complex compounds in a single step.

In one project, our group is developing titanium-catalyzed multicomponent coupling procedures to make nitrogen-based heterocycles either in a single pot or in a single step. Titanium catalysis is advantageous in that the metal is both abundant and nontoxic.

In the exploding diagram at right are some of the procedures developed for heterocyclic synthesis. These new protocols are applied to natural product synthesis and investigated for their biological activity. For example, with the Tepe group, we have discovered a new class proteasome inhibitors based on the quinoline core structure with potential applications in inflammatory disease and cancers like multiple myeloma.

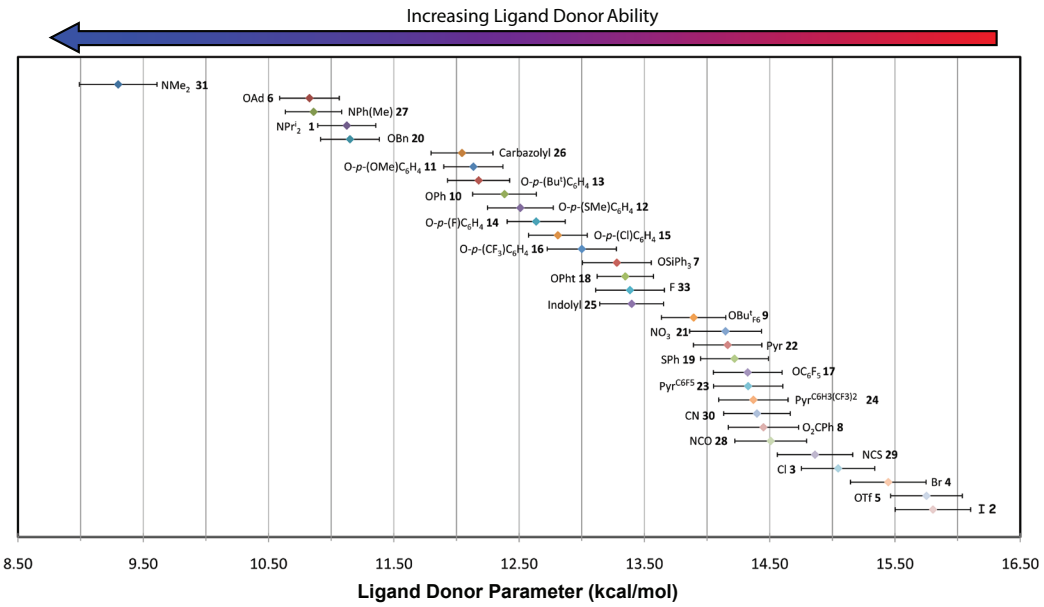


To evaluate ligands for early transition metal catalysis, like in the project above, we have developed a chromium(VI), d^0-system that is very synthetically versatile, $NCr(NPr^i_2)_2X$, where X is the ligand under scrutiny. Using this system, we parameterize ligands based on their sterics and electronics. The experimental results for a large selection of anionic ligands have been published and are shown below. Ligands are evaluated sterically using either $\%V_{bur}$ or Solid G. An illustration from the $\%V_{bur}$ analysis for the X = Cl compound is shown below, where the ligand's effect on the primary coordination sphere is estimated.



These new parameters, dubbed Ligand Donor Parameters (LDP), have been correlated with spectroscopic and reactivity data from a variety of systems and will hopefully be a useful tool for chemists when optimizing and designing high valent catalysts.

In these projects, and others, we are attempting to widen and optimize the applications of transition metals, and we are investigating new possibilities for applications in human health and other areas.



Selected Publications

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A 4-Coordinate Ru(II) Imido: Unusual Geometry, Synthesis, and Reactivity, Singh, A. K.; Levine, B. G.; Staples, R. J.; Odom, A. L., *Chem. Commun*. **2013**, *49*, 10799-801.

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