

Will McKeen, April 8, 2013, Talent Scout

Talent: Kevin M. Smith

Ph. D Kevin Smith's research concentrates on the synthesis and characterization of organometallic chromium catalysts in the formation of carbon-carbon bonds¹.

Research Goals:

Despite their tendency to produce undesirable side-reactions, cheaper first-row transition metal catalysts have an incredible potential to replace more expensive, lower row metal catalysts. In order to demonstrate the feasibility of first-row transition metal catalysts the Smith group has endeavored to fully characterize the relationship between the reactivity and structure of chromium(II) complexes with tunable ancillary ligands^{2,3}.

Ligand Effects in Chromium Catalyzed C-P Bond Formation⁴

Smith's group was able to demonstrate that the reactivity of the reaction in figure 1 could be controlled by the structure of the chromium catalyst (figure 1).

Different catalytic activity was observed by changing the N-aryl group on the diketiminate on the catalyst. Since

chromium(II) had been previously established to trap carbon-based radicals, the researcher's ability to control the rates of these reactions offered an opportunity to explore the chromium catalyst's ability to mediate carbon based radical reactions. They were able to show that steric hindrances from the N-aryl groups negatively affected the chromium's oxidative addition of the alkyl halide. They concluded that the use of a cheaper first-row transition metal can parallel the reactivity of a more expensive, noble metal catalyst.

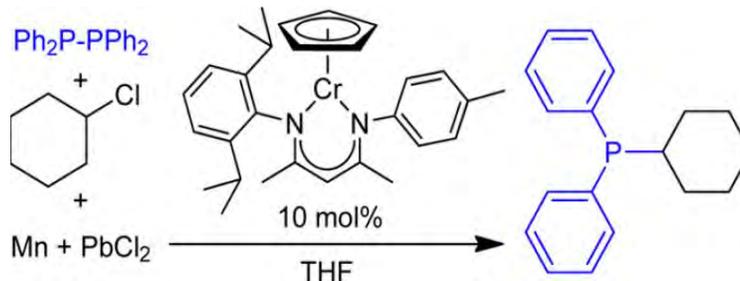


Figure 1: The synthesis of Ph₂PCy with the use of chromium cyclopentadienyl β-diketiminate⁵.

¹ <http://www.ubc.ca/okanagan/chem/faculty/smith.html>

² **Oxidatively Induced Reductive Elimination from a Chromium(III) Bis(aryl) Complex** K. Cory MacLeod, Brian O. Patrick, and Kevin M. Smith, *Organometallics* **2012** *31* (18), 6681-6689

³ **Electronic Effects in the Oxidative Addition of Iodomethane with Mixed-Aryl β-Diketiminate Chromium Complexes** Wen Zhou, Liming Tang, Brian O. Patrick, and Kevin M. Smith *Organometallics*, 2011, *30* (3), pp 603-610 DOI: 10.1021/om100961f

⁴ **Controlling Secondary Alkyl Radicals: Ligand Effects in Chromium-Catalyzed C-P Bond Formation** Wen Zhou, K. Cory MacLeod, Brian O. Patrick, and Kevin M. Smith. *Organometallics*, 2012, *31* (21), pp 7324-7327. DOI:10.1021/om300846u

⁵ Image from abstract of ⁴.