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Department of Chemistry Seminar Series Fall 2020

Time to bring some serenity to FLPs: Metal-free borylation by “*not-so Frustrated*” Lewis pairs

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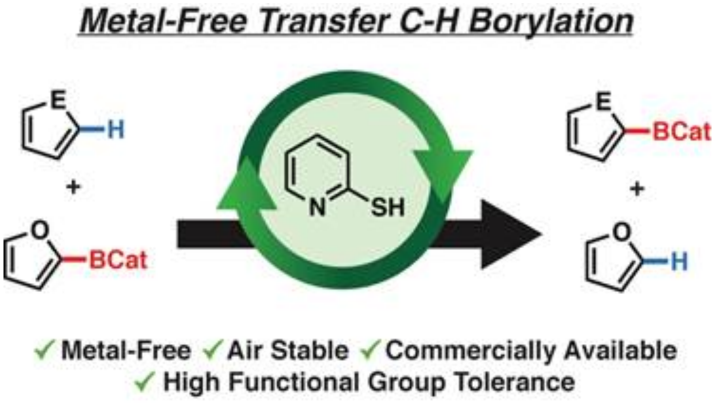
Host: Prof. Titel Jurca

November 13, 2020 10:00 AM – Zoom

Meeting Room: https://ucf.zoom.us/j/95787434425 Passcode: 184066



Frustrated Lewis Pairs (FLPs) have been conceptualized in most fields of chemical sciences.[1] Whereas the “classic” definition of a Frustrated Lewis Pair (FLP) involves the absence of Lewis pair formation caused by steric congestion, we reported in the past decade several cases of classical Lewis pairs doing typical FLP chemistry.[2] This lead us to claim that “Frustrated Lewis Pair” is rather defined by its chemistry, hereby by kinetic factors, than by thermodynamic considerations such as the absence of an interaction between a Lewis acid and a Lewis base.[3] To better exemplify this notion of FLP catalysis, we developed the metal-free borylation of heteroarenes using amino-borane species, which are stable Lewis adducts.[4,5] Development of these metal-free catalysts has allowed to generate air-stable precursors that can borylate heteroarenes on the kilogram scale.[6,7] Recently, this chemistry was extended to the concept of isodesmic borylation, *aka* transfer borylation (Figure 1).[8] By avoiding hydroboranes, we were able to borylate for the first time heteroarenes containing alkene and alkyne moieties, a reaction that has never been reported using transition metal catalysts.

Bio

Frédéric joined the Chemistry Department of Université Laval in 2004 with a Ph.D. in Organometallic Chemistry from University of Montreal and a NSERC postdoctoral fellowship at UC Berkeley (T. Don Tilley). He holds a Tier 1 Canada Research Chair in Green Catalysis and Metal-Free Processes since 2018. His research expertise is centered on the development of main group catalysts for the functionalization of inert molecules, including the reduction of carbon dioxide into methanol derivatives. He is also working on the use of silica and carbon materials for the catalytic conversion of CO_2 and epoxides into cyclic carbonates.

References

[1] Stephan, D. *J. Am. Chem. Soc.* **2015**, *137*, 10018-10032. [2] Fontaine, F.-G; Rochette, É. *Acc. Chem. Res.* **2018,** *51,* 454-464. [3] Fontaine, F.-G.; Stephan, D. W. *Phi. Trans. R. Soc. A.* **2017**, *375*, 2017004. [4] Légaré, M.-A.; Courtemanche, M.-A.; Rochette, É.; Fontaine, F.-G. *Science* **2015**, *349*, 513 – 516. [5] Légaré Lavergne, J.; Jayaraman, A.; Misal-Castro, L.; Rochette, É.; Fontaine, F.-G. *J. Am. Chem. Soc.* **2017**, *139*, 14714-14723. [6] Légaré, M.-A.; Rochette, É.; Légaré Lavergne, J.; Bouchard, N. *Chem. Commun.* **2016**, *52*, 5387-5390. [7] Jayaraman, A.; Misal Castro, L. C.; Fontaine, F.-G. *Org. Process. Res. Dev.* **2018**, *22*, 1489-1499. [8] Rochette, É.; Desrosiers, V.; Soltani, Y.; Fontaine, F.-G. *J. Am. Chem. Soc.* **2019**, *141*, 12305-12311.