

Lewis Acidic Boranes as Catalysts for Carbene Transfer Reactions

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Reactive carbenes generated from diazo compounds are key intermediates for a range of organic reactions to afford synthetically useful organic compounds. Most of these reactions have been carried out using transition metal catalysts. However, the formation of carbene intermediates using main group elements has not been extensively investigated for synthetic purposes. Recent studies have revealed that triarylboranes can be used for the in-situ generation of a reactive carbene intermediates in both stoichiometric^[1] and catalytic reactions.^[2] These new reactivities of triarylboranes have gained significant attention in synthetic chemistry particularly in catalytic studies. The variety of organic compounds that have been produced through these reactions are important as pharmaceuticals or agrochemicals. In this talk I will highlight the recent progress and ongoing challenges of carbene transfer reactions using triarylboranes as catalysts. I will also highlight the stoichiometric use of triarylboranes in which the boranes not only activate the diazo functionality to afford a carbene intermediate, but also actively participate in the reactions as a reagent (Figure 1). The different mechanisms for activation and carbene transfer will be described along with the mechanistic and computational studies that have aided the elucidation of these reaction pathways. Potential opportunities for the use of boranes as a catalyst towards different carbene transfer reactions and their future prospects will be discussed.



^[1] Santi, M.; Ould, D. M. C.; Wenz, J.; Soltani, Y.; Melen, R. L.; Wirth, T. *Angew. Chem. Int. Ed.* **2019**, *58*, 7861–7865.

^[2] Dasgupta, A.; Babaahmadi, R.; Slater, B.; Yates, B. F.; Ariafard, A.; Melen, R. L. *Chem* **2020**, *6*, 2364–2381; Dasgupta, A.; Stefkova, K.; Babaahmadi, R.; Gierlich, L.; Ariafard, A.; Melen, R. L. *Angew. Chem. Int. Ed.* **2020**, *59*, 15492–15496; Stefkova, K.; Heard, M. J.; Dasgupta, A.; Melen, R. L. *Chem. Commun.* **2021**, *57*, 6736–6739.



Rebecca L. Melen studied for her undergraduate and PhD degrees at the University of Cambridge, completing her PhD in 2012 with Prof. Wright. Following postdoctoral studies with Prof. Stephan in Toronto and with Prof. Gade in Heidelberg, she took up a position at Cardiff University in 2014, where she is now a professor. She is an author of almost 90 peer-reviewed papers in the most prestigious journals (e.g., *Angew. Chem. Int. Ed.*, *ACS Catal.*, *Chem. Sci*, *Chem. Soc. Rev.*, *Nature*, *Science*, *J. Amer. Chem. Soc.*) and belongs to the editorial advisor boards of *ACS Catal.*, *Chem. Eur. J.*, *Chem Catalysis*, *Chem*, *Organometallics*, *Asian JOC*. She has been recognized with several prestigious prizes including: EPSRC early career fellowship (2018), RSC Harrison Meldola Memorial Prize (2019), Thieme Journal Award Winner (2019), Clara Immerwahr award (2014). Her research interests lie in main group chemistry and the applications of main group Lewis acids in synthesis and catalysis.

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