Catalytic carbyne transfer in organic synthesis

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The art of organic synthesis and reaction discovery relies on logic-guided thought processes that often involve hypovalent carbon reactive species and their corresponding stabilized equivalent forms. However, not all of the possible carbon reactive intermediates and their reactivity rules have attracted the same attention by the synthetic community. This is mainly because of the perception of the lack of synthetic utility and importantly, because of the challenges associated with controlling its extreme reactivity and lack of efficient sources.

Herein, I will show how the catalytic generation of conceptually-novel radical carbyne equivalents and metal-carbynoids enabled the discovery of new carbon reactivity towards C–H and C–C bonds. The metal or photocatalytic activation of tailored sources revealed new reactivity rules at carbon that have been under-appreciated, not only in the design and discovery of new chemical reactions, but also in their use to build molecular complexity through unexplored disconnection approaches. Our catalytic carbyne transfer platform has demonstrated to be an effective and unique in the construction of chiral centers with aryl C–H bonds or by breaking C–C double bonds, and that has found applications in the late-stage functionalization of medically relevant agents and radiofluorinations.