



Activation of Diboron Reagent by Main Group Compounds and Metal Complexes

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The application of organoborane compounds is of considerable significance across chemical, medicinal, and materials sciences due to their stability and the diverse functionalization they enable via various transformation protocols.¹ The synthesis of organoboron compounds commonly proceeds through hydroboration or borylation, utilizing metal-catalyzed or metal-free strategies that activate diboron reagents.² Traditional approaches typically employ organometallic reagents and precious metal catalysts, including transition metals such as Pt, Rh, Re, Ru, and notably Ir, which have been extensively developed over past decades. However, the high cost and limited availability of these metals underscore the need for more sustainable catalytic systems based on main-group elements. We have developed a NHC-supported Co-based catalyst for the borylation of various organic substrates such as aryl halides, alkyl halides, alkenes and alkynes etc.³

A notable advancement in diboron activation has been achieved recently, where two nucleophilic species can coordinate with both the boron atoms of the diboron reagent, facilitating B-B bond cleavage. In this context, we have developed a protocol for the homolytic cleavage of B-B bonds in diboron compounds utilizing simple diazabutadiene.⁴ We have also developed a protocol for direct diborylation of azoarenes using its photo switchable nature without the use of any catalyst.⁵ The thorough mechanistic studies proposed a sequential coordination mechanism for the transformation and ruled out the involvement of a radical pathway. These methodologies expand the synthetic methodology for organoboron chemistry, offering new pathways to functionalized boronic esters.

References

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Geetharani obtained her Ph.D. from Indian Institute of Technology Madras in 2012. Soon after, she moved to University of Wurzburg, Germany for her postdoctoral studies with Prof. Holger Braunschweig as an Alexander von Humboldt fellow and began her independent research career as assistant professor at department of inorganic and physical chemistry, Indian Institute of Science Bangalore, India, in 2016. She is a recipient of DST-Inspire Faculty Award. She has also been awarded Young Associate-Indian Academy of Sciences, INSA-Young Scientist medal, NASI-Young Scientist Platinum Jubilee and SERB-Women Excellence Award. Her research interests are in the areas of catalysis, main group and organometallic chemistry. She is a member of the editorial board of Inorganic Chimica Acta (2024-), Chemistry – An Asian Journal (2022-), early career advisory board of European Journal of Inorganic Chemistry (2024-).



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