

University of Louisville  
Department of Chemistry

## Gaganpreet Kaur Literature Seminar

When: April 8th, 2021

Time: 2:30 PM

Location: Microsoft TEAMS

# Recent Advances in Carbon-Boron (C—B) Bond Forming Reactions

### Abstract

Organoboron compounds are the most versatile intermediates for various valuable chemical transformations, such as, oxidations,<sup>1</sup> halogenation,<sup>2</sup> aminations,<sup>3</sup> carbonylations,<sup>4</sup> etc. Although organoboron compounds are known for over a century, the research related to organoboron chemistry gained momentum after the development of hydroboration reactions.<sup>5</sup> In modern organic synthesis, organoboron compounds are extensively used in various Pd-catalyzed reactions, most importantly, Suzuki-Miyaura and other named cross-couplings, widely used in pharmaceutical industries.<sup>6</sup> Considering the significance of these coupling reactions, sustainable synthesis of organoboron compounds demands more advancements. Therefore, this presentation will highlight the recent advances of C—B bond-forming reactions emphasizing mechanistic details and applications.

Among many methodologies for C-B bond formation, hydroboration of olefins is the most common.<sup>7</sup> However, the regioselectivity, requirement of toxic and rare-earth metals, and expensive ligands have always remained a significant concern. To address these issues, the recently reported “*ligand-free Fe-catalyzed regioselectivity-controlled hydroboration of aliphatic terminal alkenes*” is a prime example of the sustainable opportunities in this research area.<sup>8</sup> This reported approach is efficient and sustainable for the regioselective synthesis of alkyl borates using the most abundant transition metal and without any ligand. Another key method for C—B bond formation involves the decarbonylative borylation in which the formation of biaryl byproduct and requirement of strong base always remained an unresolved issue.<sup>9</sup> To solve this issue, Sanford and co-workers report nickel-catalyzed decarbonylative borylation using carboxylic acid fluorides.<sup>10</sup> It is an excellent methodology for base-free and highly selective synthesis of aryl boronate esters involving detailed mechanistic insights towards the transmetalation reactivities of different boron reagents. Alternatively, C-H borylation represents an ideal approach as it involves the direct replacement of inactive C-H to C-B bond.<sup>11</sup> Although several research groups have made significant progress towards the *ortho* and *meta* selective C-H borylation, *para* selective C-H borylation is still a challenge.<sup>12</sup> Recently, Phipps and co-workers developed a new catalytic strategy for *para* selective practical C-H borylation that involves the utilization of ion-pair interactions.<sup>13</sup>

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