

# Organoboron Compounds: Prevalent and Novel Applications

Jian-Qing Qi

Tsinghua University

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清华大学  
Tsinghua University

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# Characteristics of Boron<sup>1</sup>

Table: Atomic Radii

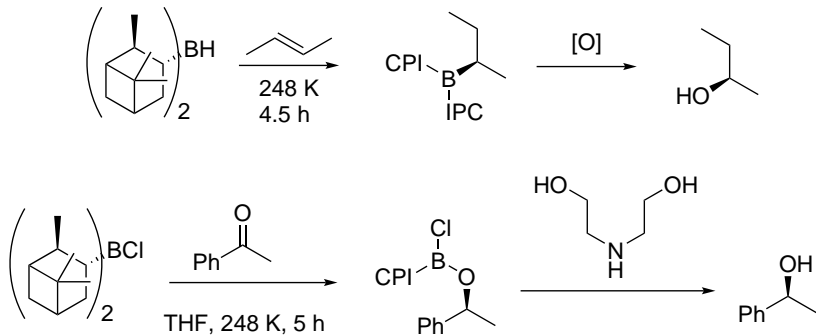
	B	C
$r_{vdw}(\text{\AA})$		1.70
$r_{cov}(\text{\AA})$	0.83	0.68

Table: Bond Dissociation Energy

Bonds	$D_{298K}^{\circ} (kJ \cdot mol^{-1})$
B-B	290
B-H	$345.2 \pm 2.5$
C-C	$618 \pm 15.4$
C-H	$318.4 \pm 1.2$

<sup>1</sup>David R. Lide. *CRC Handbook of Chemistry and Physics*. 90th Edition (CD-ROM Version 2010). Boca Raton, FL.: CRC Press/Taylor and Francis.

# Asymmetric Reduction of $C=C^2$ and $C=O^3$ Bonds



<sup>2</sup>Herbert C. Brown, Manoj C. Desai, and Prabhakar K. Jadhav. "Hydroboration. 61. Diisopinocampheylborane of high optical purity. Improved preparation and asymmetric hydroboration of representative cis-disubstituted alkenes". In: *The Journal of Organic Chemistry* 47.26 (1982). DOI: 10.1021/jo00147a004.

<sup>3</sup>Herbert C. Brown, J. Chandrasekharan, and P. V. Ramachandran. "Chiral synthesis via organoboranes. 14. Selective reductions. 41. Diisopinocampheylchloroborane, an exceptionally efficient chiral reducing agent". In: *Journal of the American Chemical Society* 110.5 (1988). DOI: 10.1021/ja00213a030.

# Diastereoselective Allylboration<sup>4</sup>

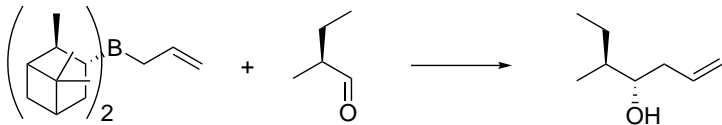
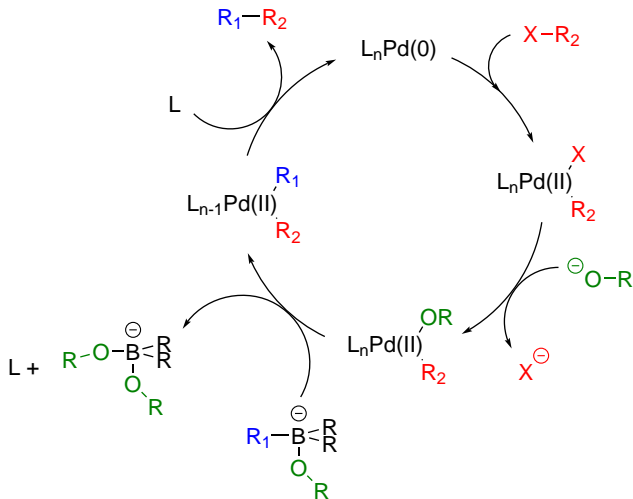


Figure: Diastereoselective Allylboration

<sup>4</sup>Herbert C. Brown, Krishna S. Bhat, and Ramnarayan S. Randad. " $\beta$ -Allyldiisopinocampheylborane: a remarkable reagent for the diastereoselective allylboration of  $\alpha$ -substituted chiral aldehydes". In: *The Journal of Organic Chemistry* 52.2 (1987), pp. 319–320. ISSN: 0022-3263. DOI: 10.1021/jo00378a042. URL: <https://doi.org/10.1021/jo00378a042>.

# Suzuki-Miyaura Cross-Coupling



# Tandem Diels-Alder Cycloaddition

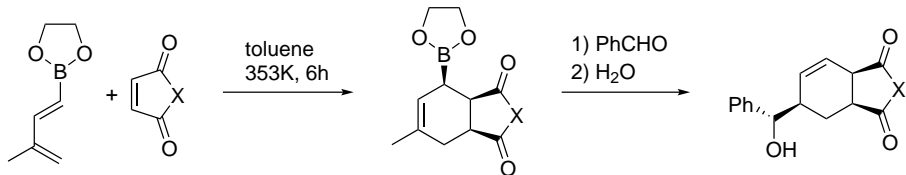


Figure: A Module Figure

The diastereoselectivity of this two-step process is very high, that is why this process is very important for generating multiple stereocentres from rather simple starting materials.<sup>5</sup>

<sup>5</sup>Jadwiga Pyziak, Jędrzej Walkowiak, and Bogdan Marciniak. "Recent Advances in Boron-Substituted 1,3-Dienes Chemistry: Synthesis and Application". In: 23.15 (2017). DOI: 10.1002/chem.201602124.

# A Synthetic Example<sup>6</sup>

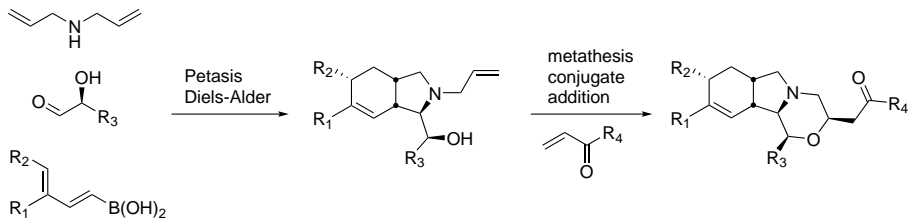
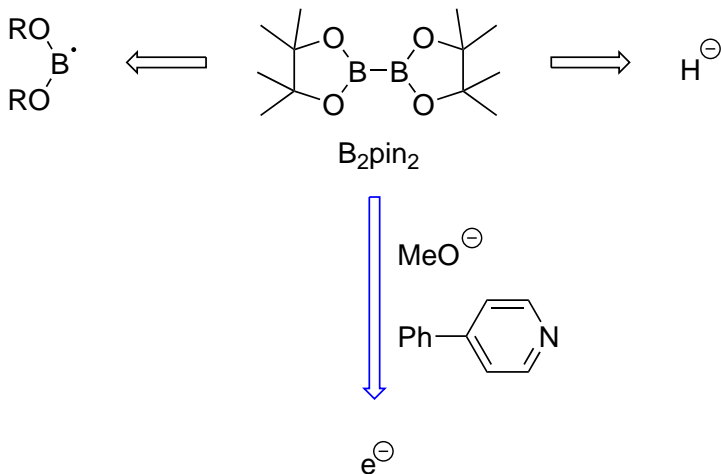


Figure:

<sup>6</sup>Alexandre Cannillo et al. "Fast Synthesis of Complex Enantiopure Heterocyclic Scaffolds by a Tandem Sequence of Simple Transformations on  $\alpha$ -Hydroxyaldehydes". In: *Chemistry – A European Journal* 19.28 (2013). DOI: 10.1002/chem.201301712



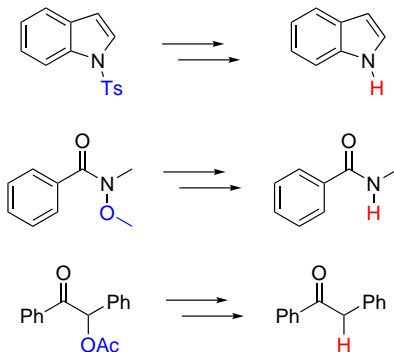
# Latest application of $B_2pin_2$ <sup>7</sup>



<sup>7</sup>Li Zhang and Lei Jiao. "Super electron donors derived from diboron". In: *Chemical Science* 9.10 (2018). DOI: 10.1039/C8SC00008E.

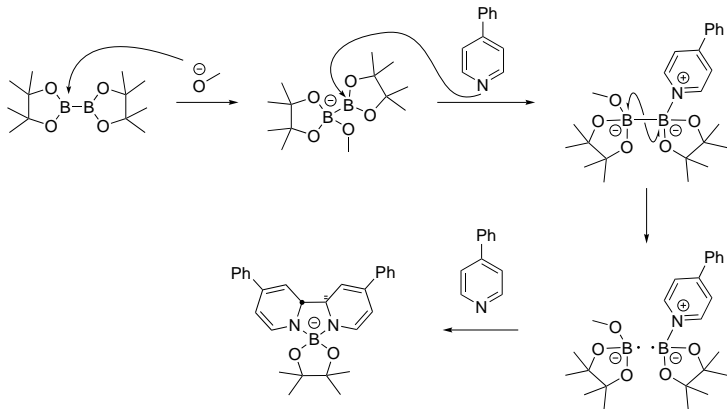
# Synthetic Applications of the New Method

When applied with  $B_2pin_2$ , p-PhPy, MeOK, the following reactions can take place<sup>8</sup>:



<sup>8</sup>Li Zhang and Lei Jiao. "Pyridine-Catalyzed Radical Borylation of Aryl Halides". In: *Journal of the American Chemical Society* 139.2 (2017). DOI: 10.1021/jacs.6b11813.

# Mechanisms of this Method



# Acknowledgments

thanks

- Prof. Jiao
- Associated Prof. Chen
- ...

# Annex

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