

# Metal-Free C-H Borylation of (Hetero)Arenes

Literature seminar

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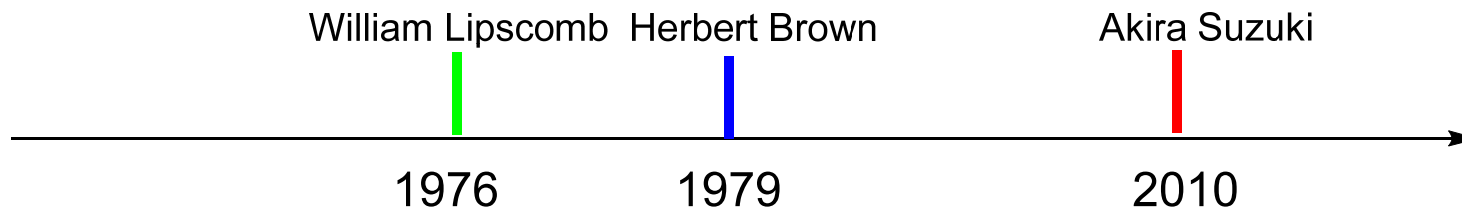
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- C-H borylation promoted by borenium or boronium species
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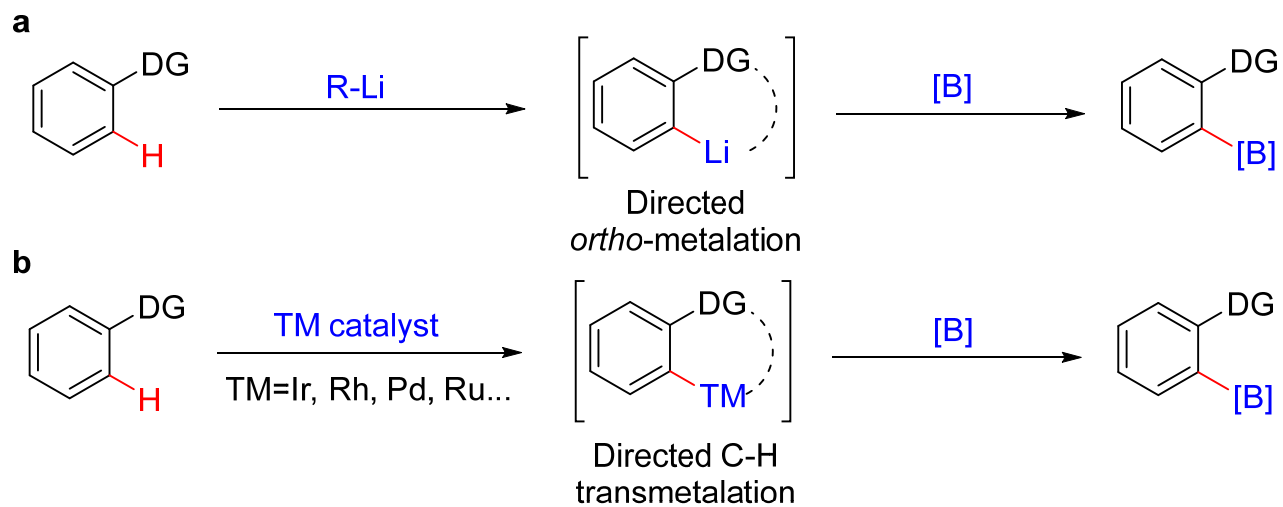
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# Introduction

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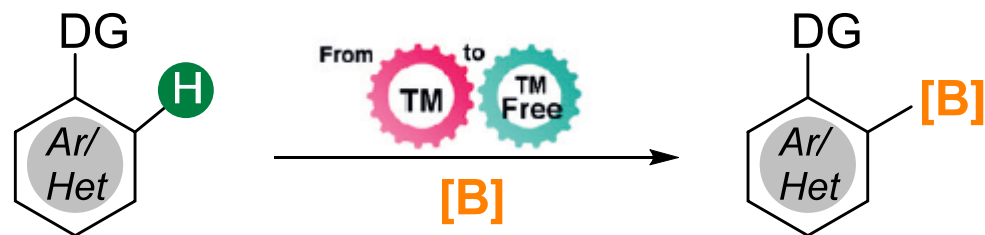


## Nobel Prizes related to boron chemistry



# Introduction

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## Direct C-H bond borylation

Transition metal-catalyzed:

- (1) powerful and atom-efficient
- (2) excellent substrate tolerance
- (3) low crustal abundance, high cost and toxic
- (4) high costs to removing residual catalysts

Metal-free method:

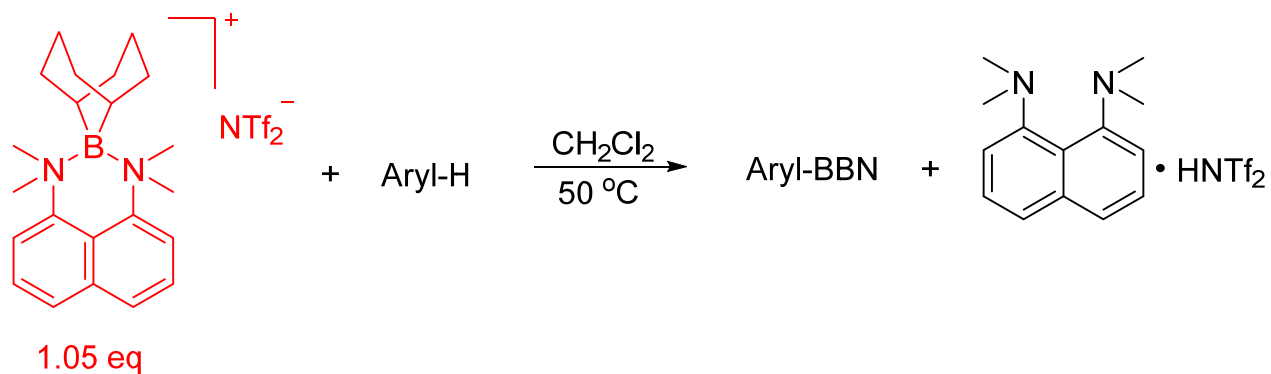
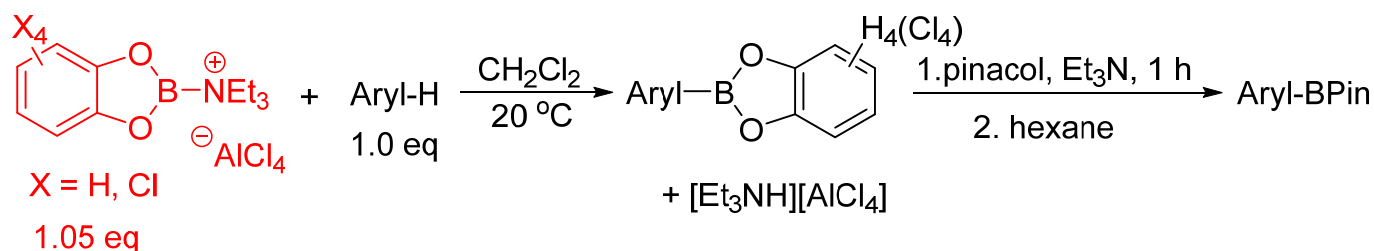
- (1) inexpensive and environmentally benign
- (2) large-scale syntheses
- (3) complementary regioselectivity

***C-H borylation promoted by  
borene or boronium species***

# C-H borylation promoted by borenium or boronium species

**Borenium:** cations containing boron in tricoordinate

**Boronium:** cations containing tetracoordinated boron

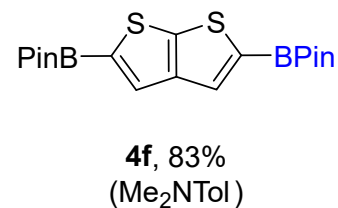
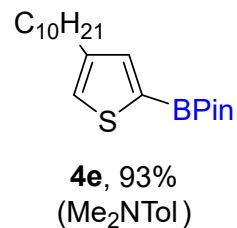
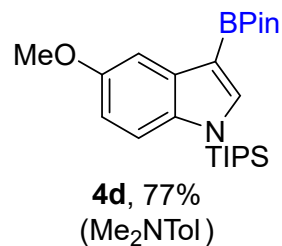
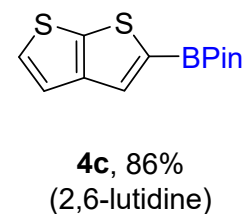
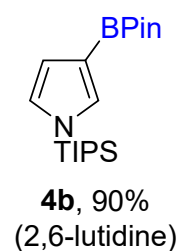
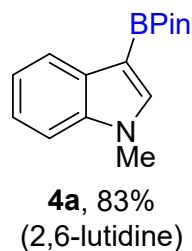
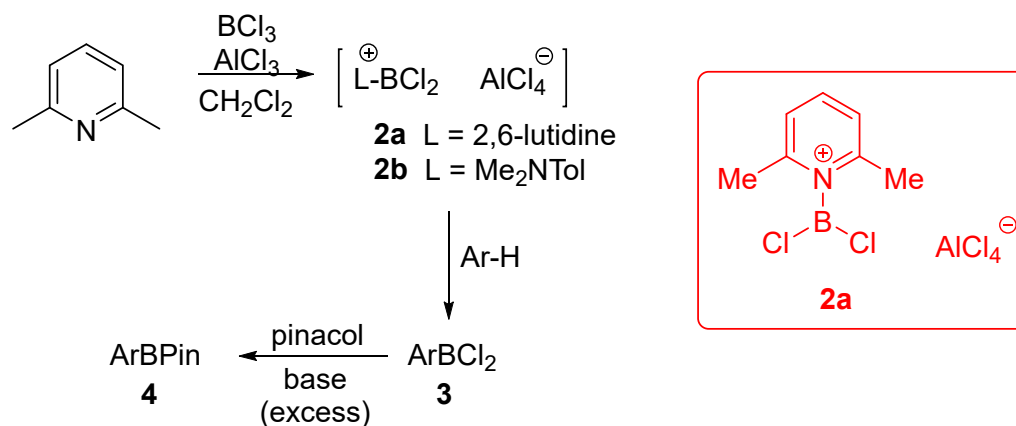


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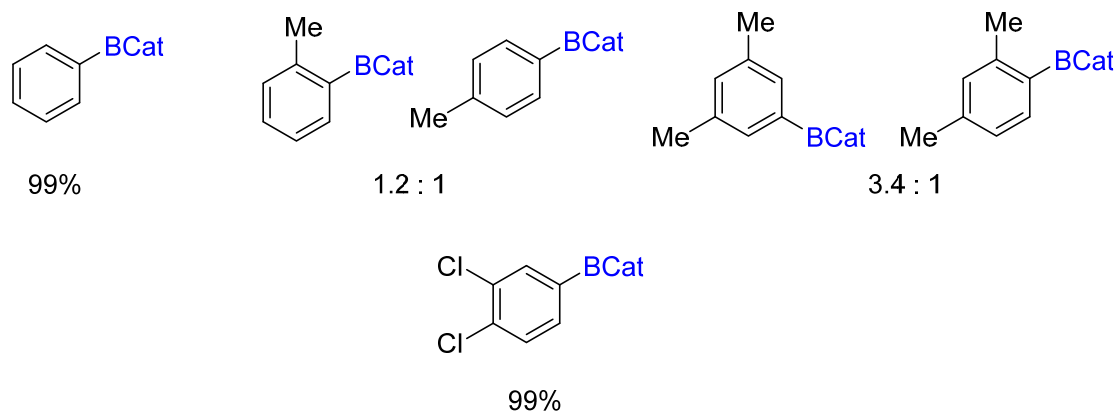
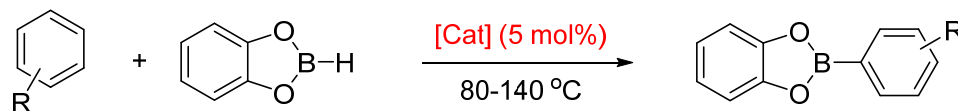
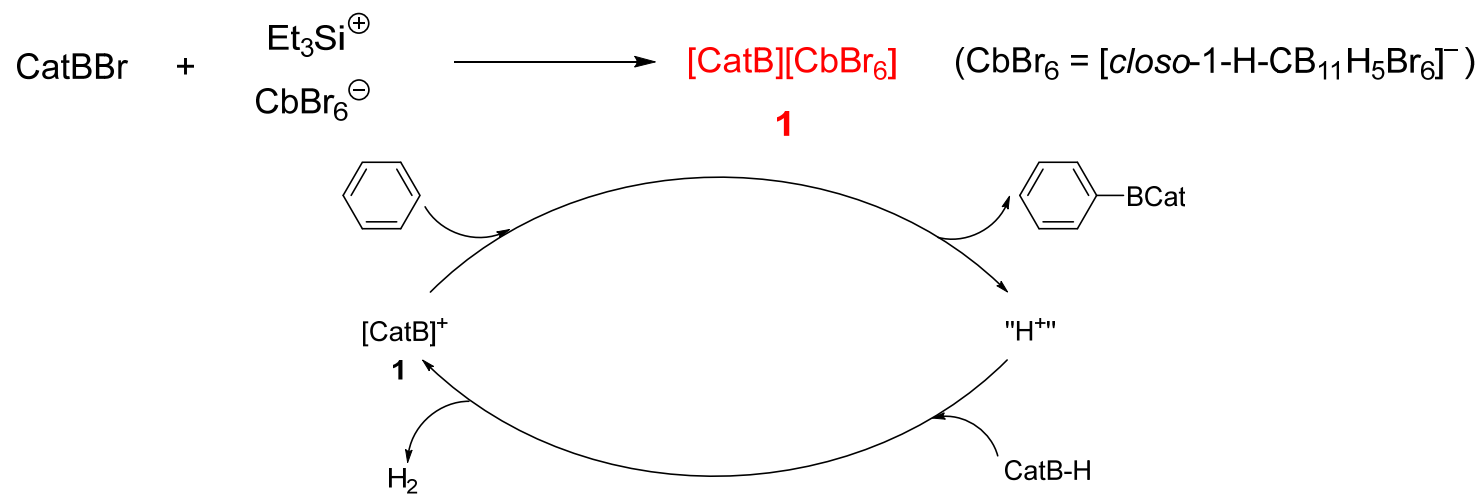
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# C-H borylation promoted by borenium or boronium species



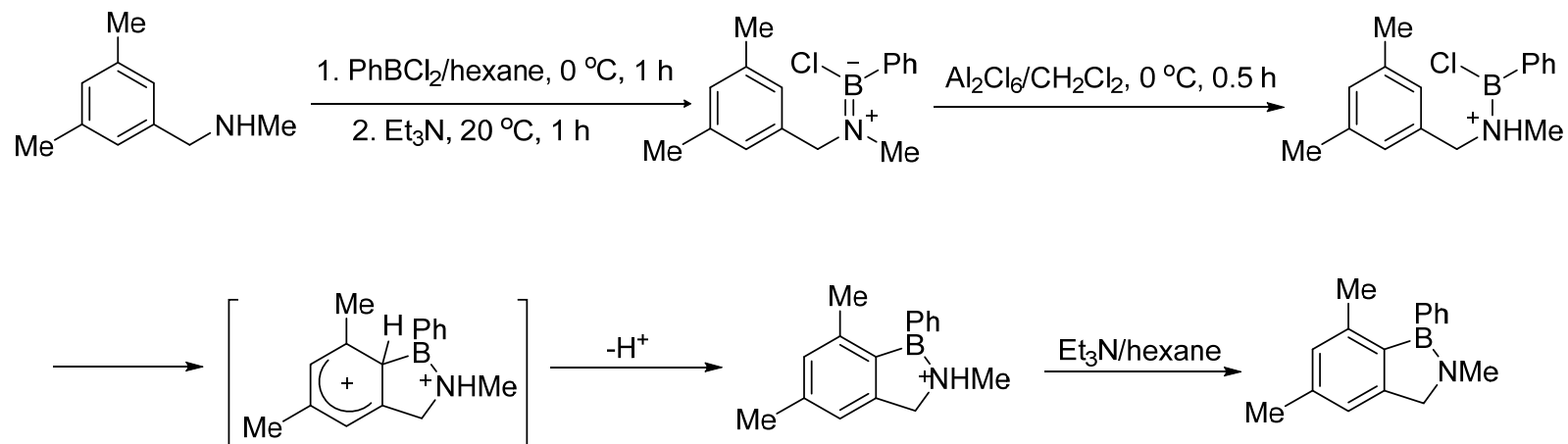
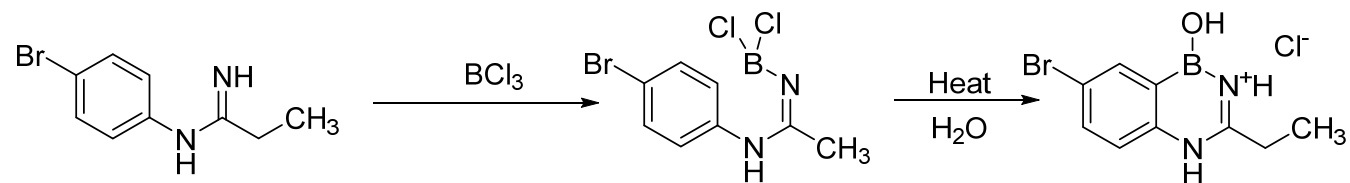
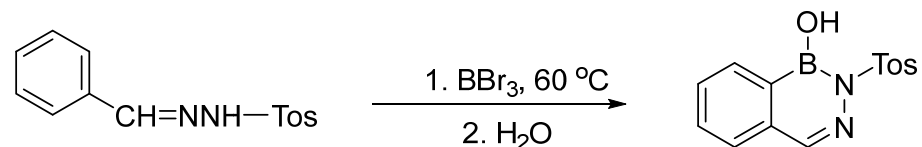
# C-H borylation promoted by borenium or boronium species





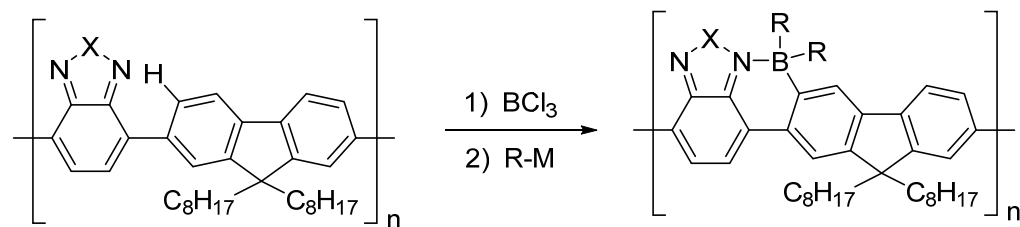
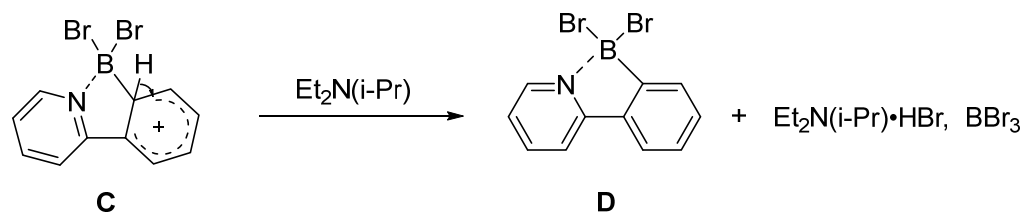
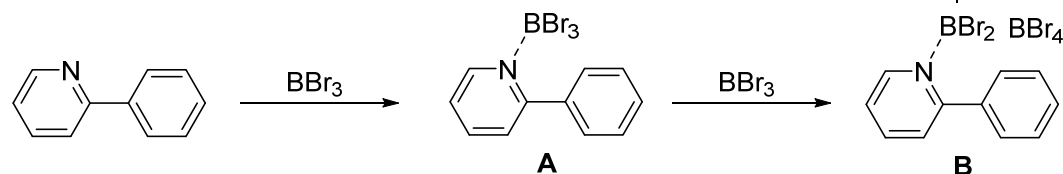
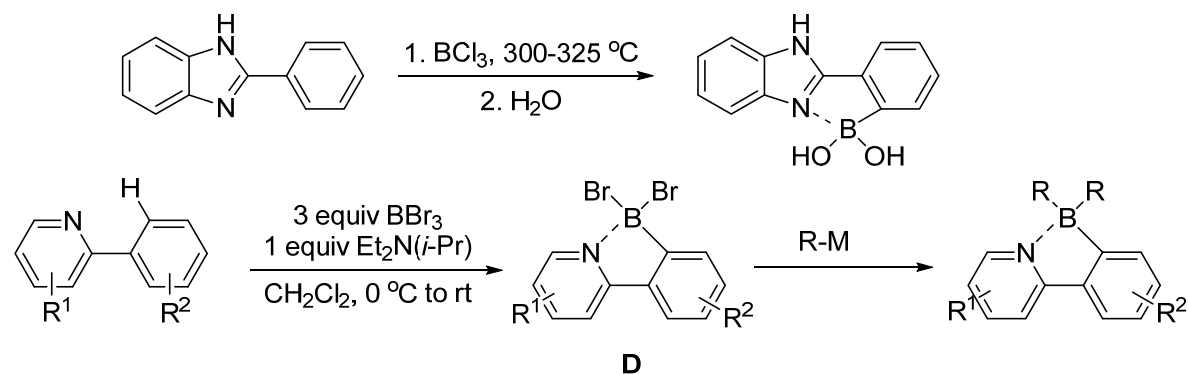
# *N/P-directed C-H borylation*

# N/P-directed C-H borylation



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# N/P-directed C-H borylation

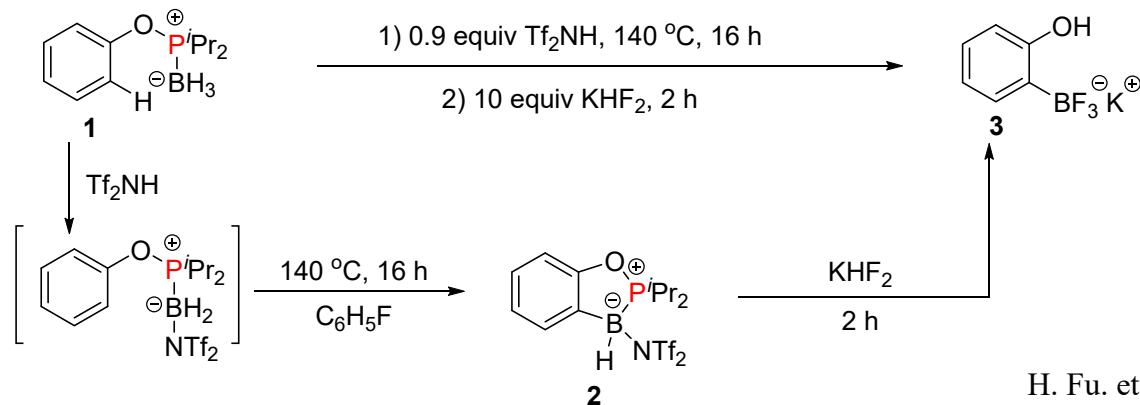
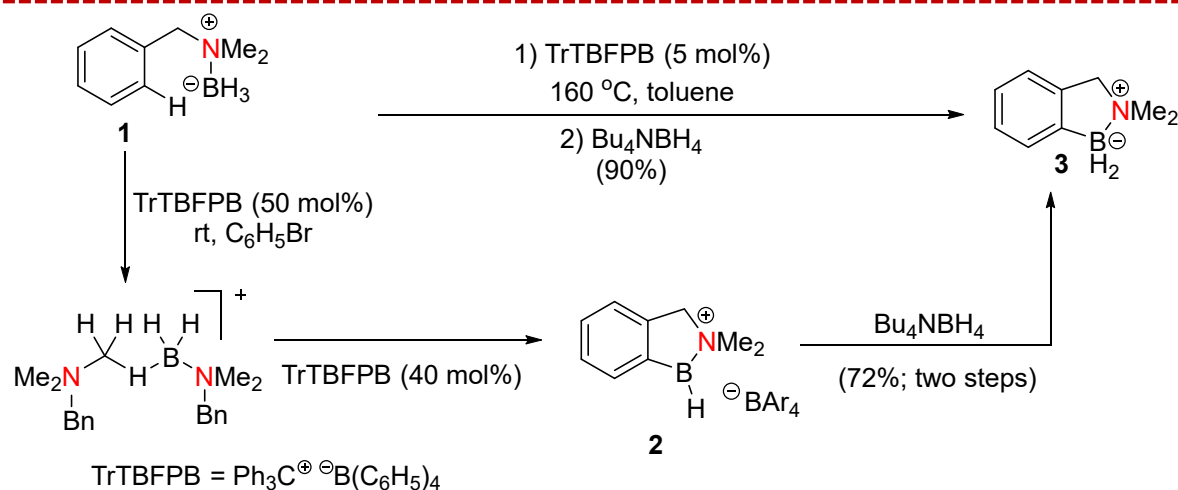
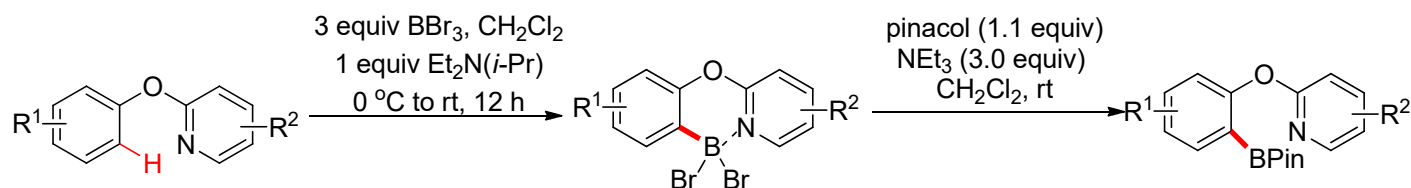


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# N/P-directed C-H borylation



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