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Palladium-Catalyzed Ligand-Directed C–H Functionalization Reactions

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Reporter: Yi Zhang

Superior: Prof. Yong Huang

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Contents

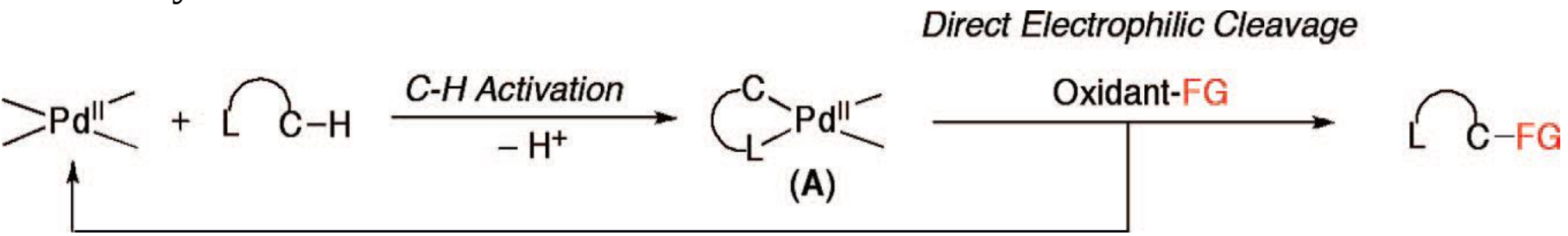
Introduction:

Thomas Lyons was born in Ottawa, IL, in 1983. He received his B.S. degree with honors in Chemistry from DePaul University in 2005 under the mentorship of Professor Matthew Dintzner. He is currently a Ph.D. candidate in Professor Melanie Sanford's research laboratory, where he is studying regioselective oxidative coupling reactions.

Melanie Sanford received her B.S. and M.S. degrees at Yale University, where she carried out undergraduate research in the laboratory of Professor Robert Crabtree. She pursued graduate studies at the California Institute of Technology working with Professor Robert Grubbs. Following postdoctoral work at Princeton University with Professor John Groves, she joined the faculty at the University of Michigan in the summer of 2003 as an Assistant Professor of Chemistry. In spring 2007 she was promoted to her current position of Associate Professor of Chemistry. She has been recognized with a number of awards, including a Presidential Early Career Award in Sciences and Engineering, an Arthur Cope Scholar award from the American Chemical Society, and the BASF catalysis award. Research in the Sanford group focuses broadly on the development and mechanistic study of new transition-metal-catalyzed reactions for applications in organic synthesis. The group is working to develop a diverse set of transformations for the direct conversion of unactivated carbon–hydrogen bonds into new functional groups with high levels of chemo-, regio-, and stereoselectivity.

Electrophilic Functionalization Pathway

Pathway A:



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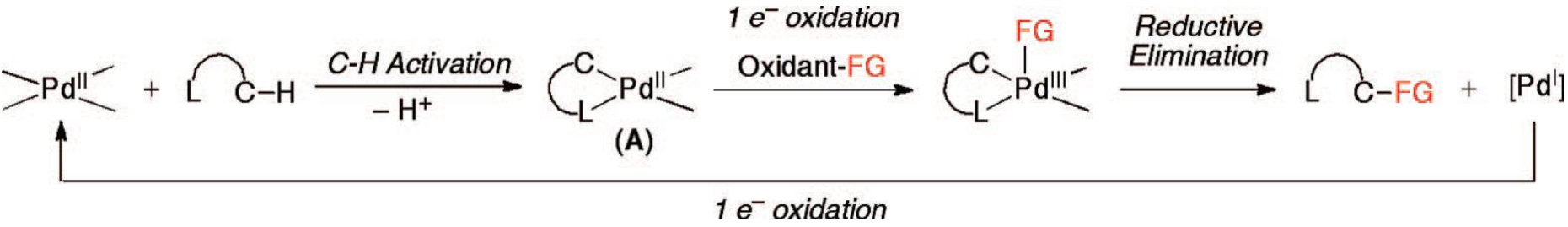
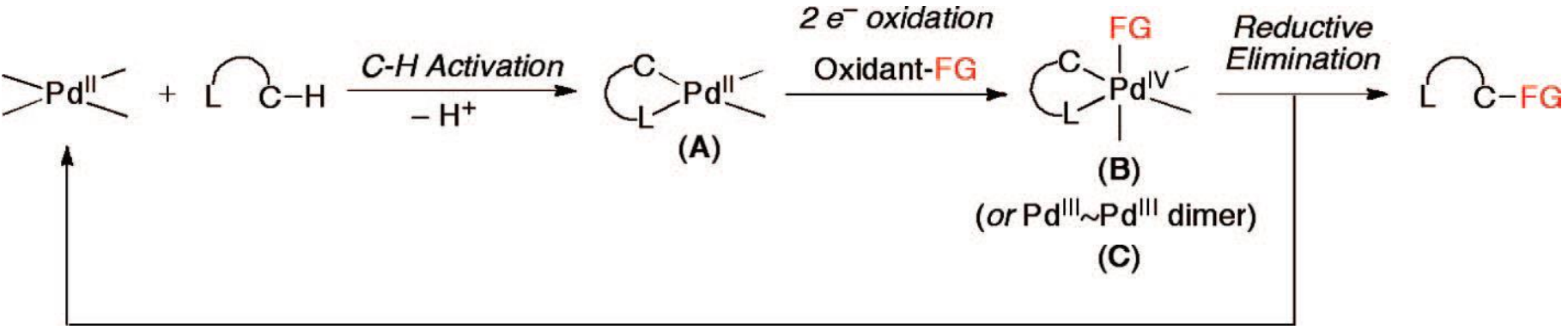
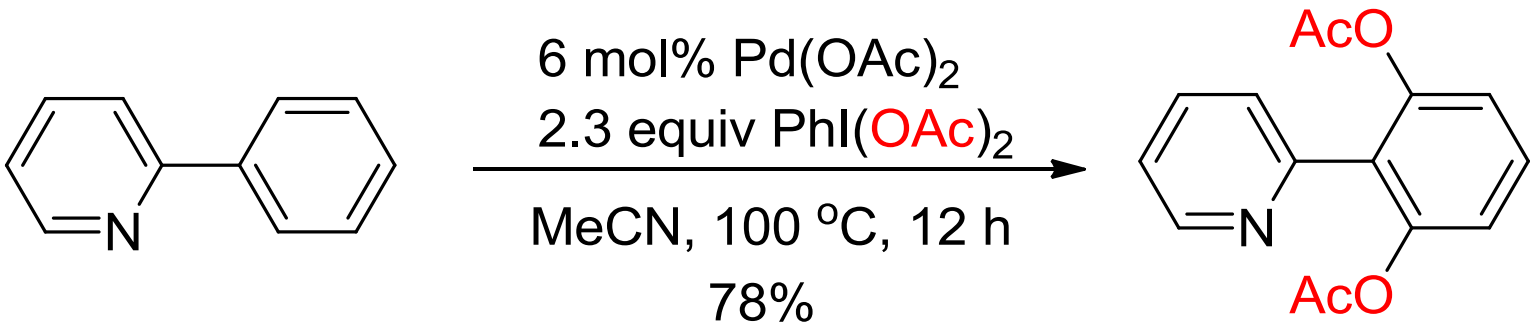
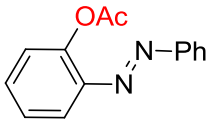


Pathway C:



Acetoxylation with $PhI(OAc)_2$





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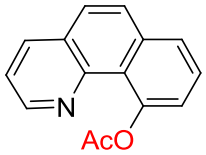

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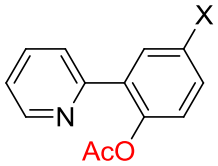

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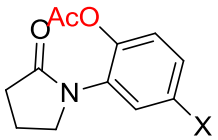
X=Br 83%
X=CF_3 81%
X=OMe 78%

54%



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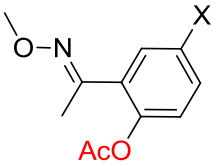
X=CH_3 74%
X=OMOM 81%
X=OMe 73%



X=F 57%
X=CH_3 72%
X=CN 66%
X=OMe 78%

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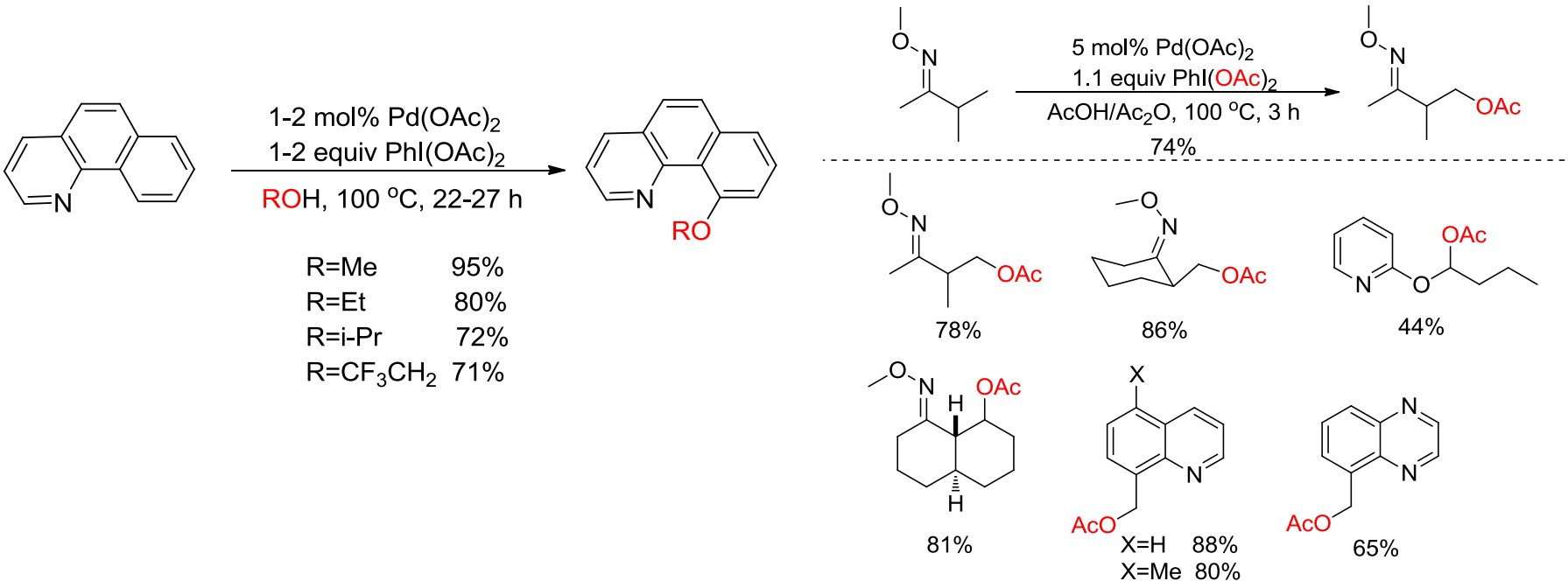

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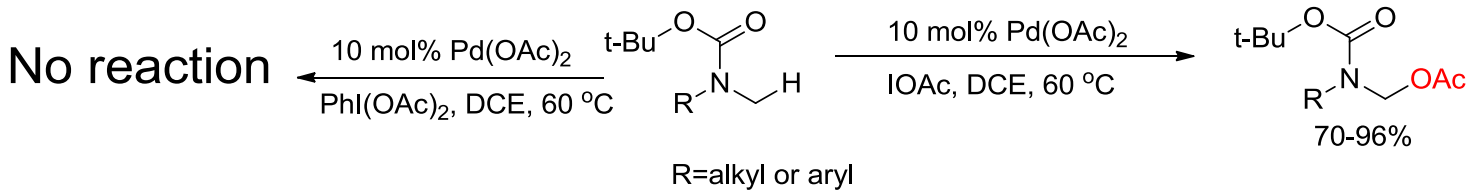
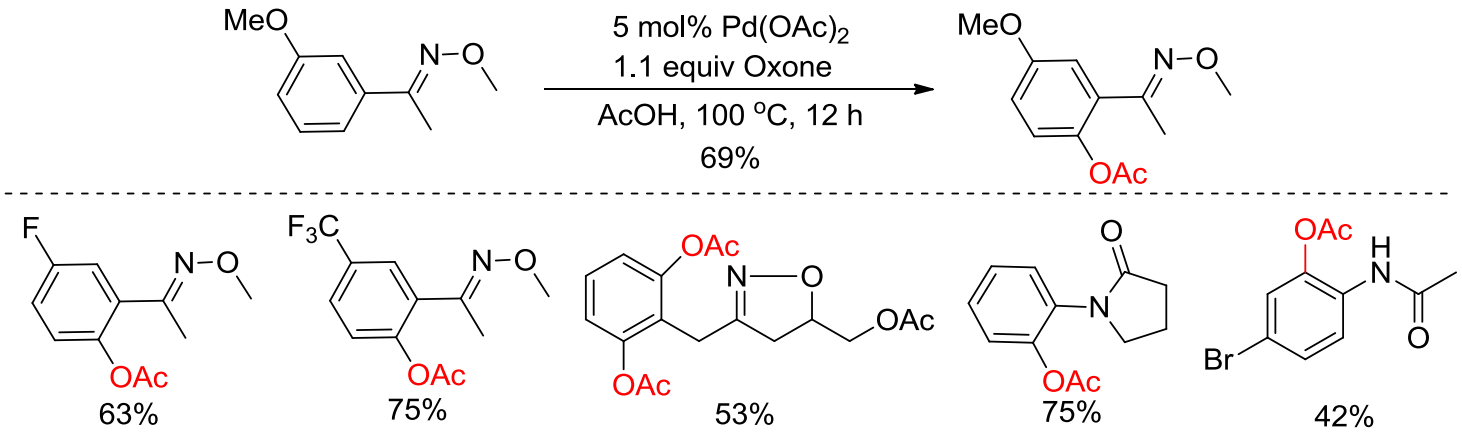
Acetoxylation with other oxidants



Wang, D. H.; Hao, X. S.; Wu, D. F.; Yu, J. Q. *Org. Lett.* **2006**, *8*, 3387



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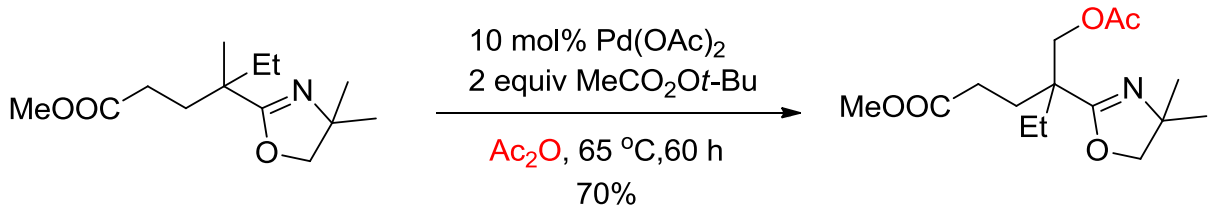

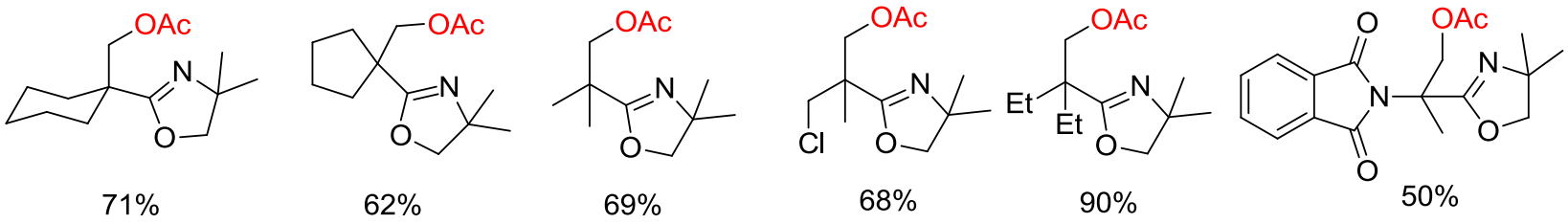

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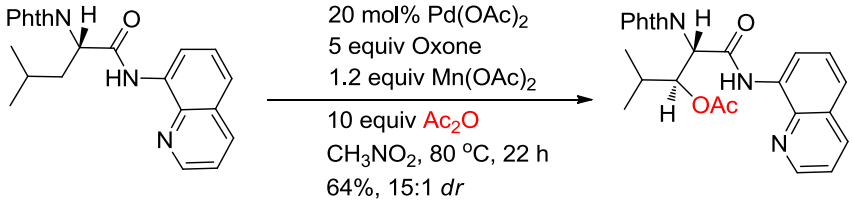

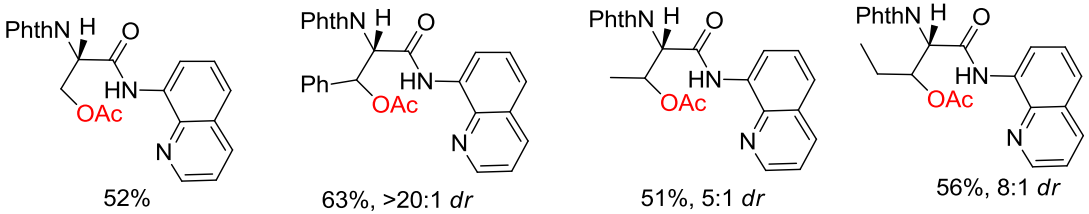

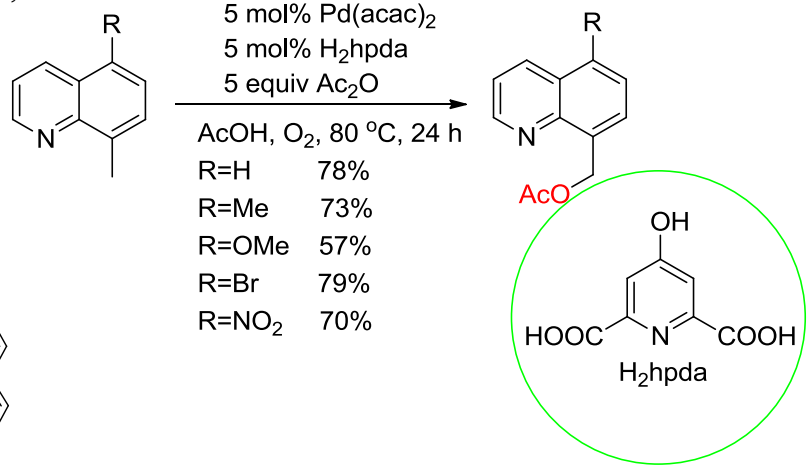

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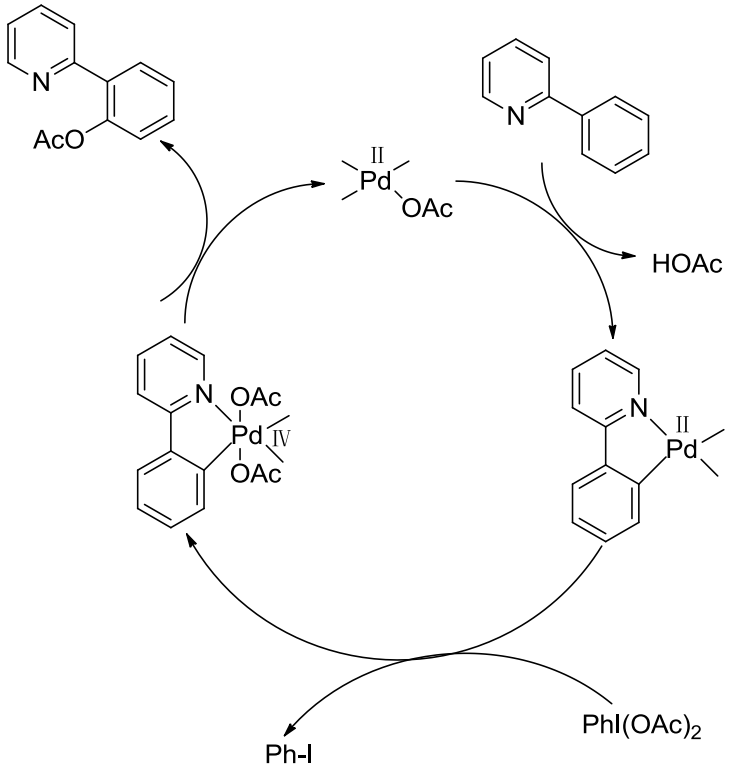
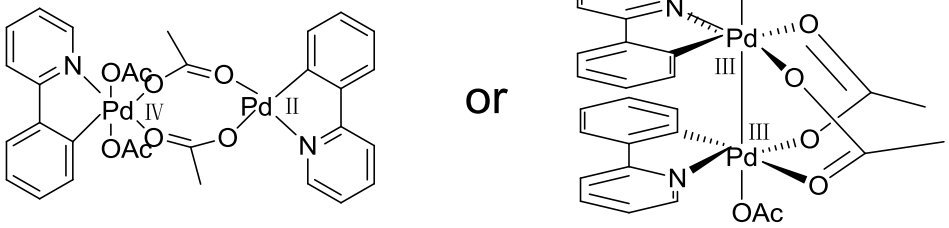
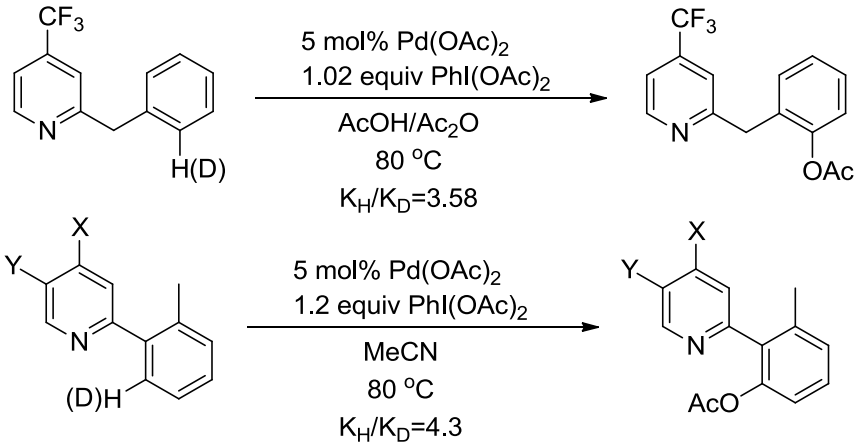
Mechanism of Acetoxylation







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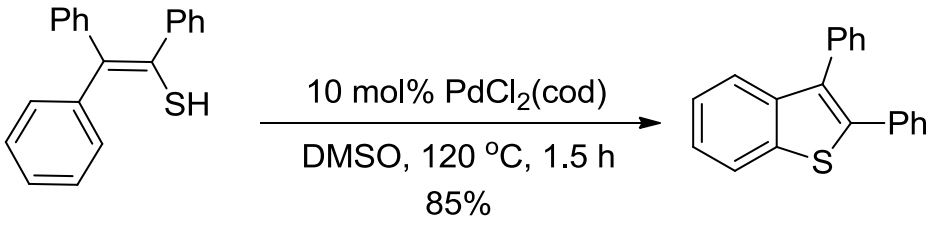
C-S Bond Formation



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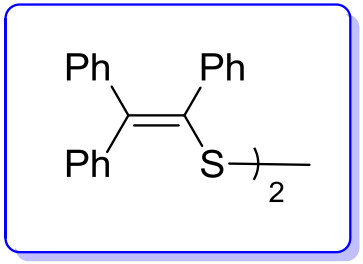

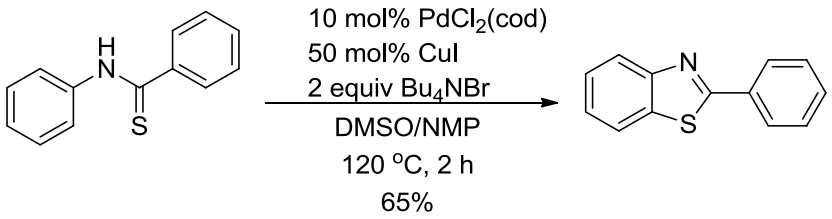

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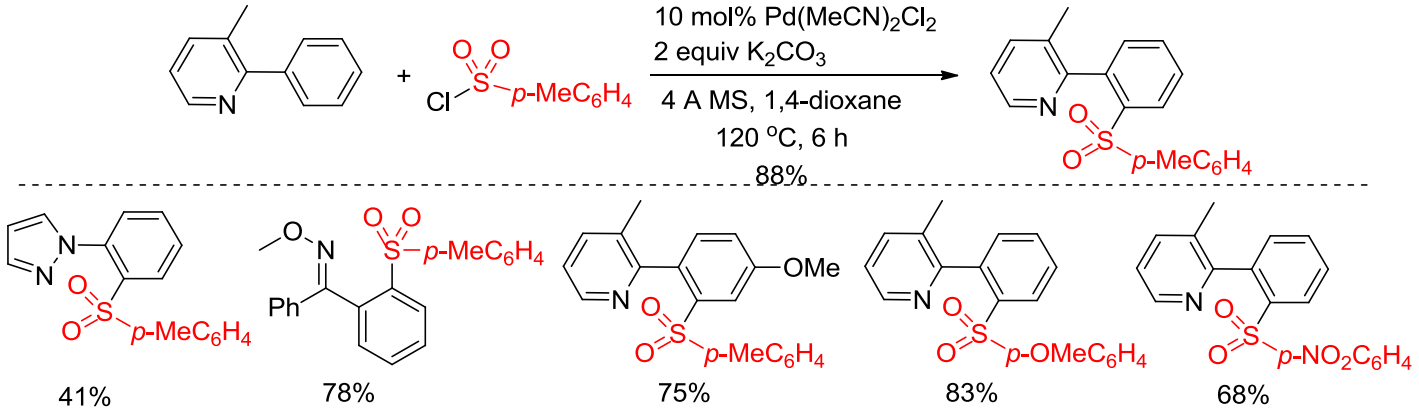

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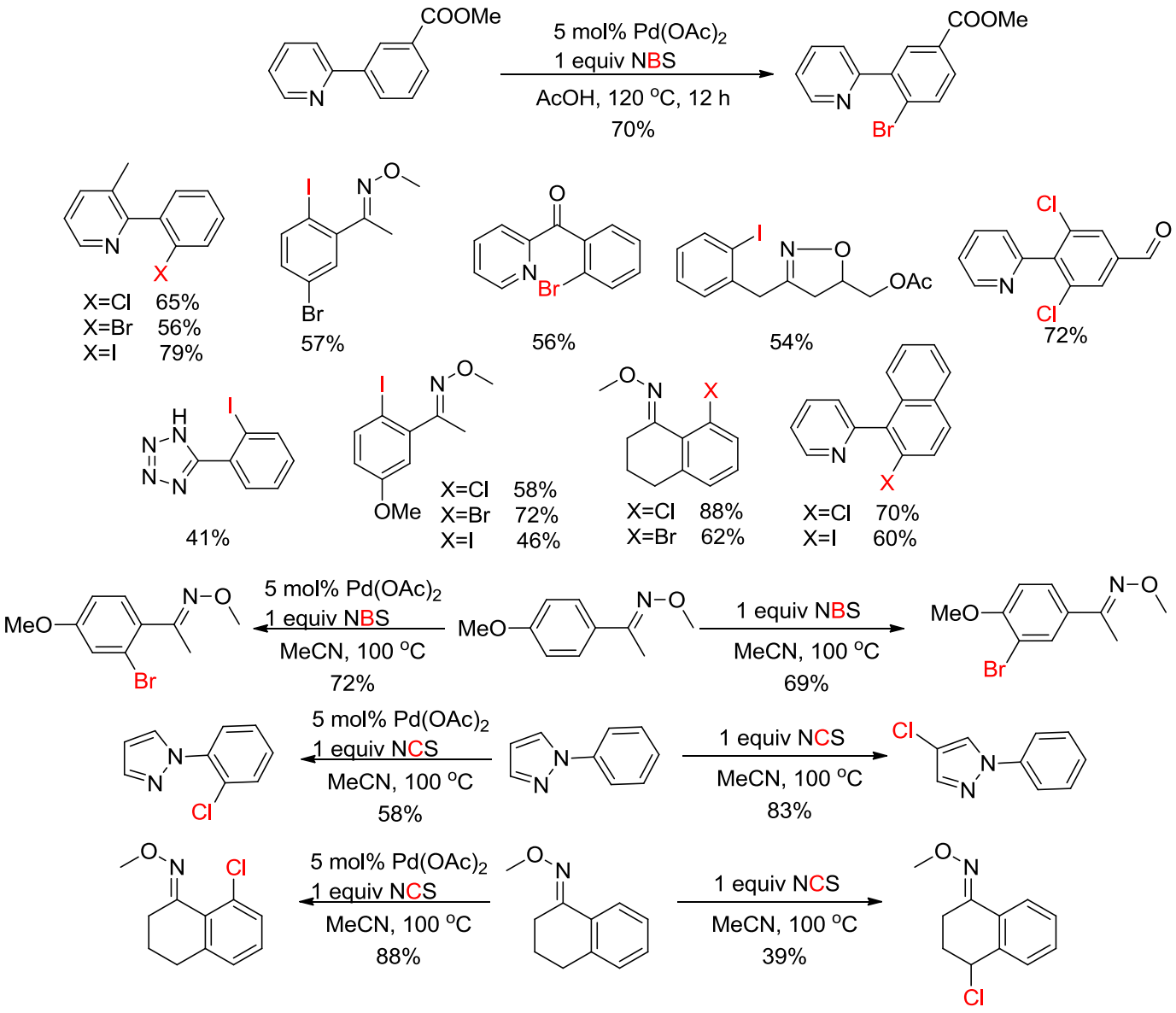
C-X Bond Formation



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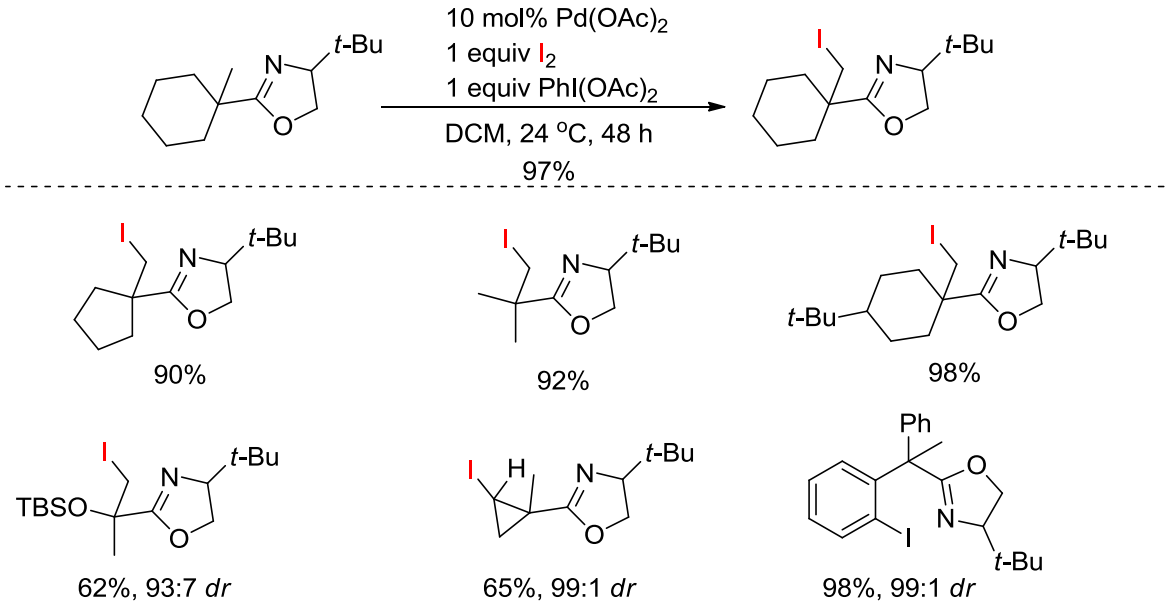

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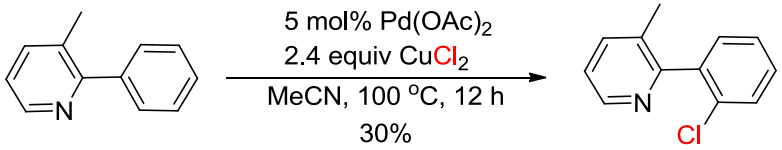

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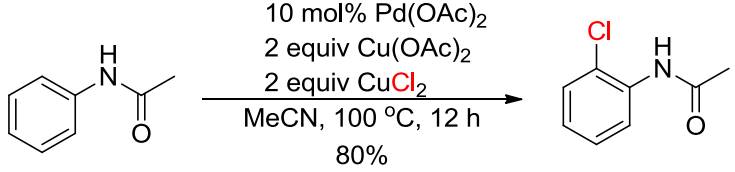

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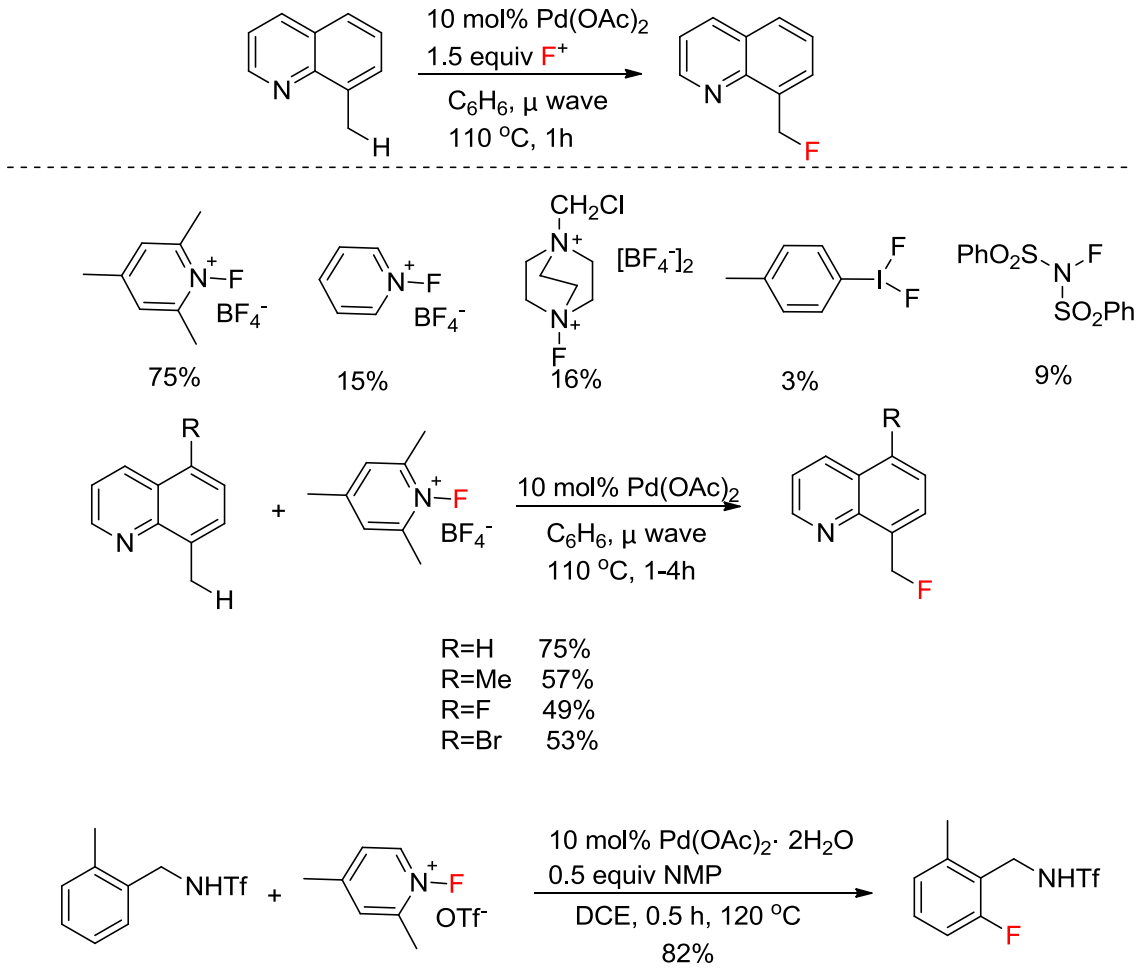

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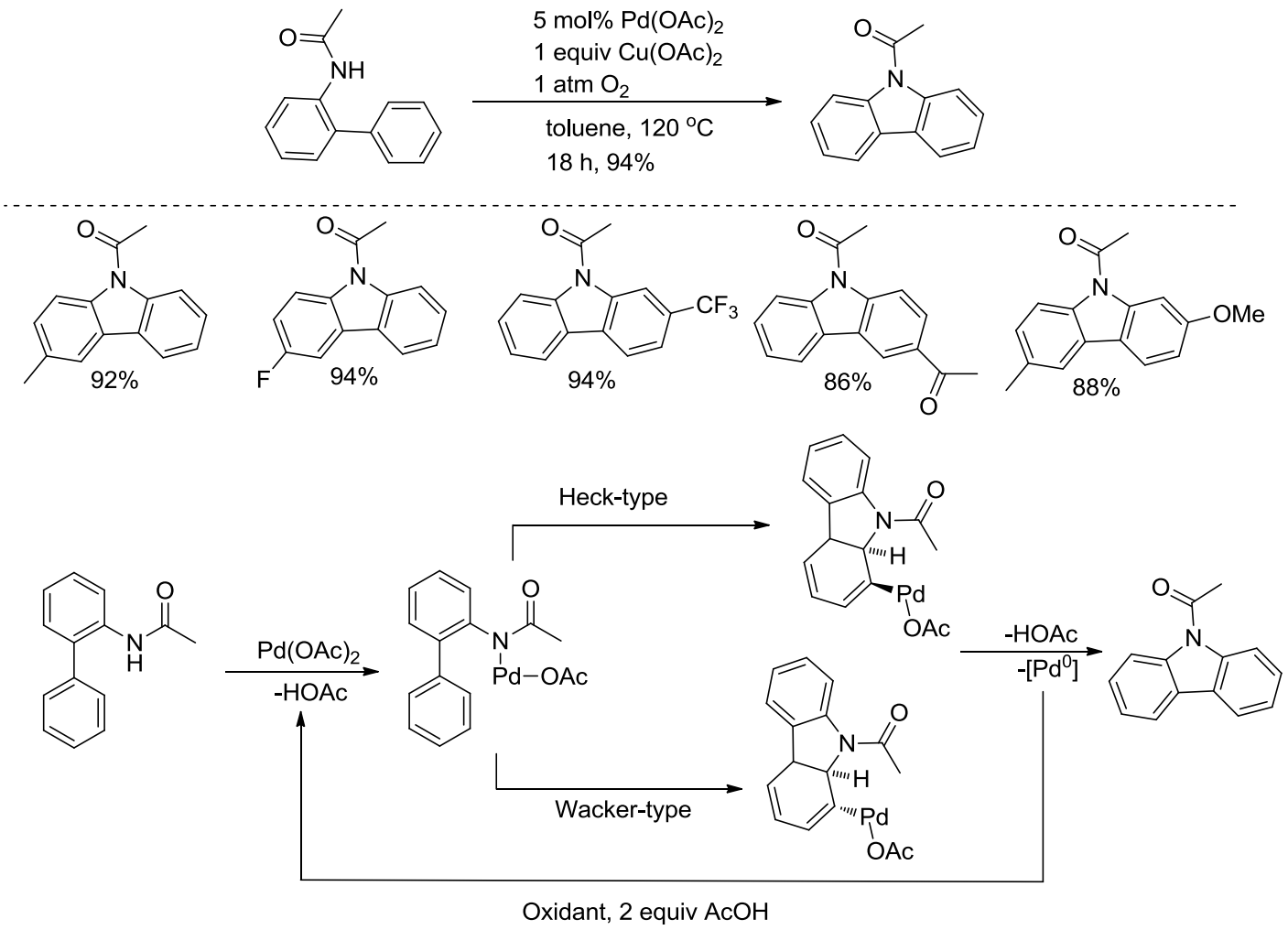
C-N Bond Formation



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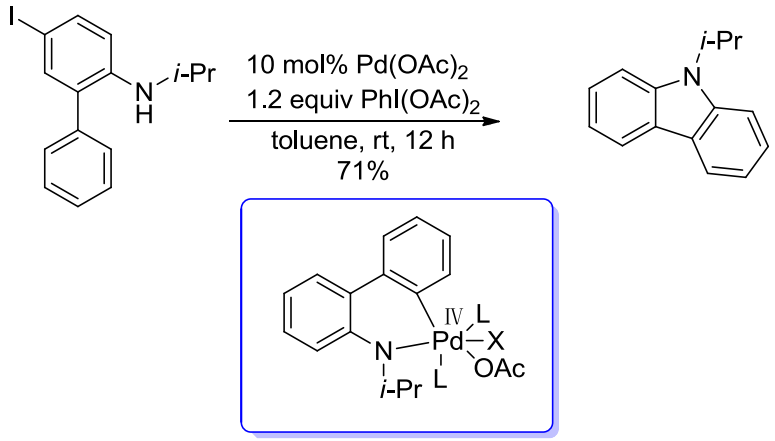

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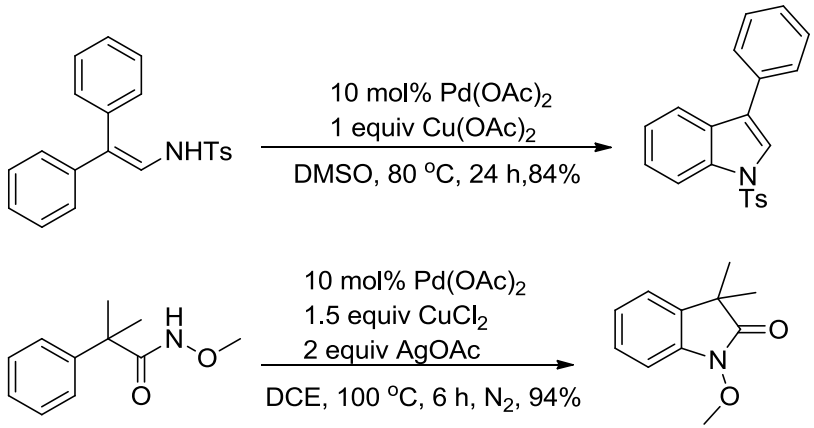

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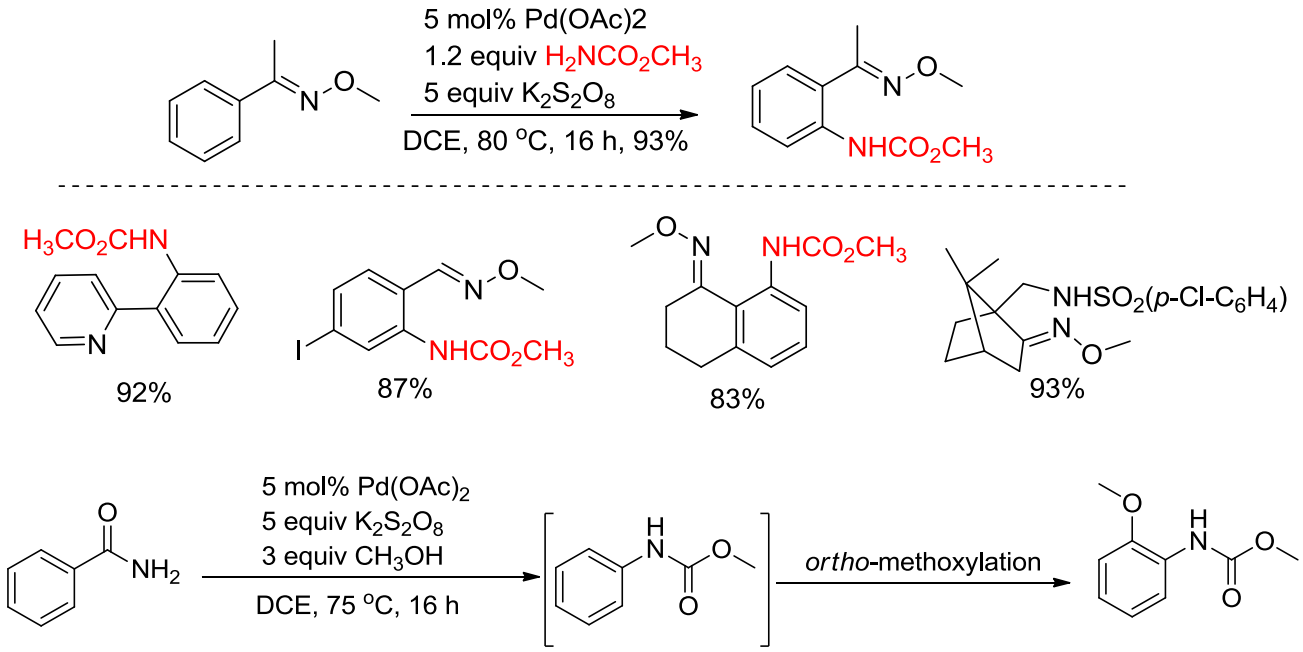

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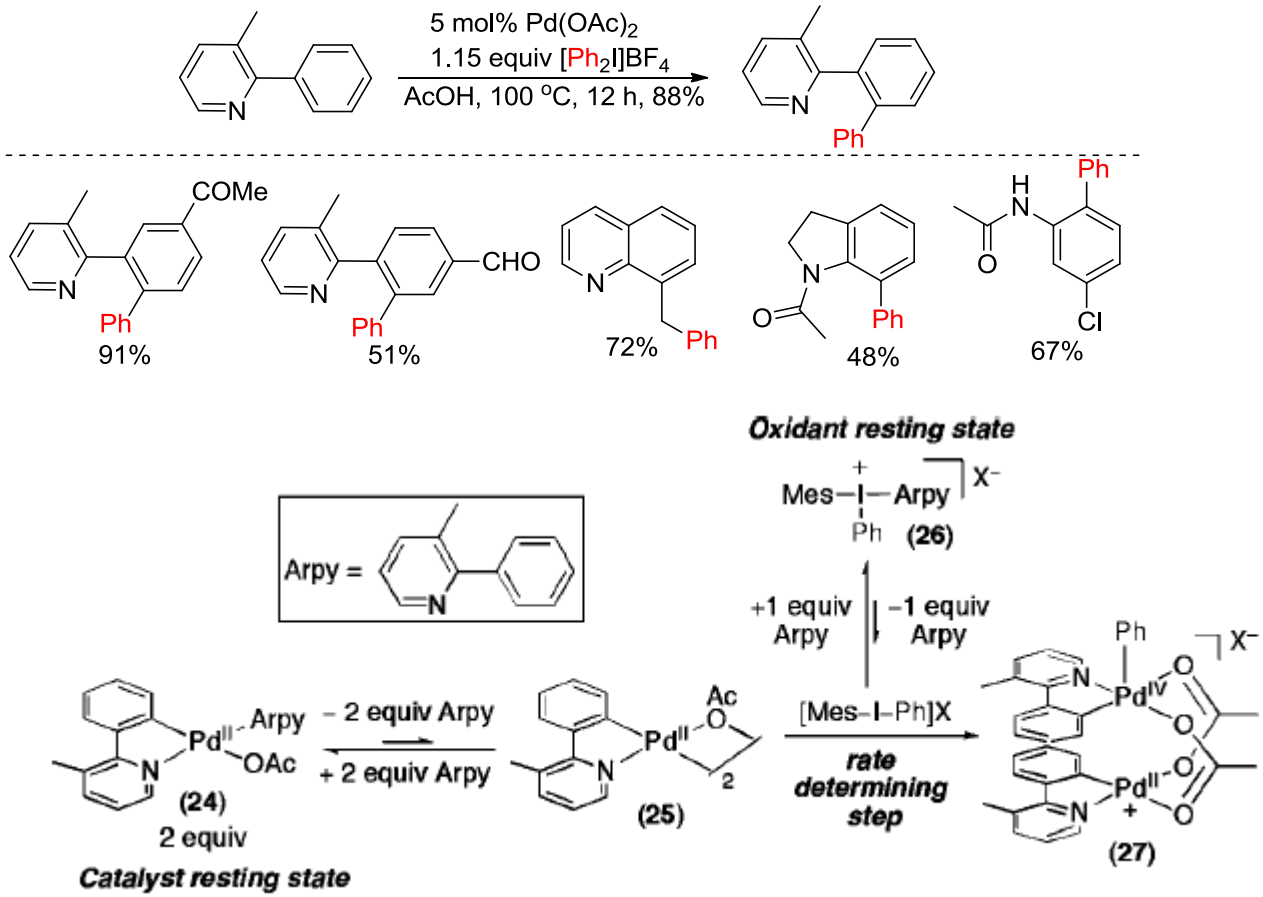
C-C Bond Formation



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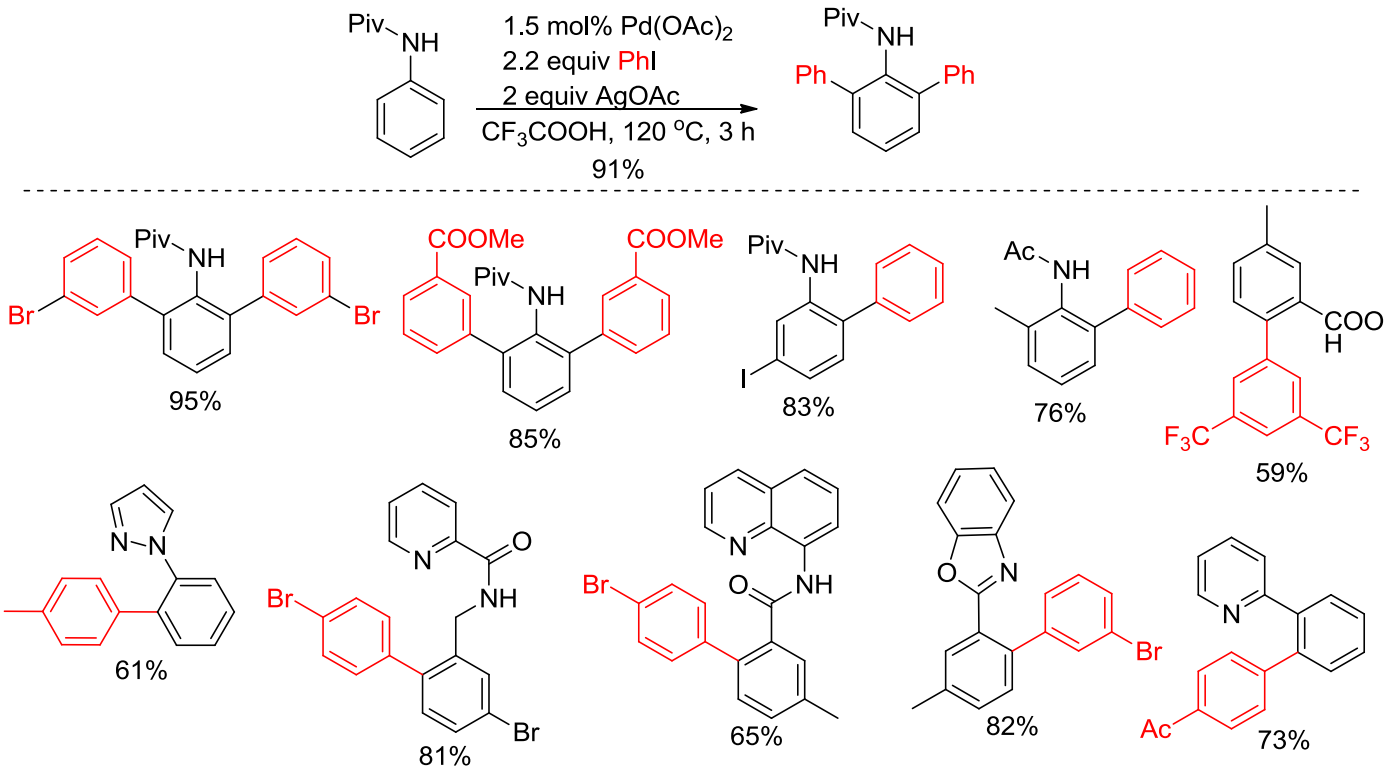

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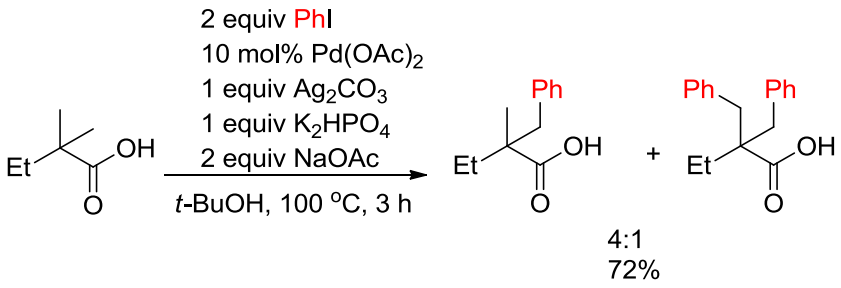

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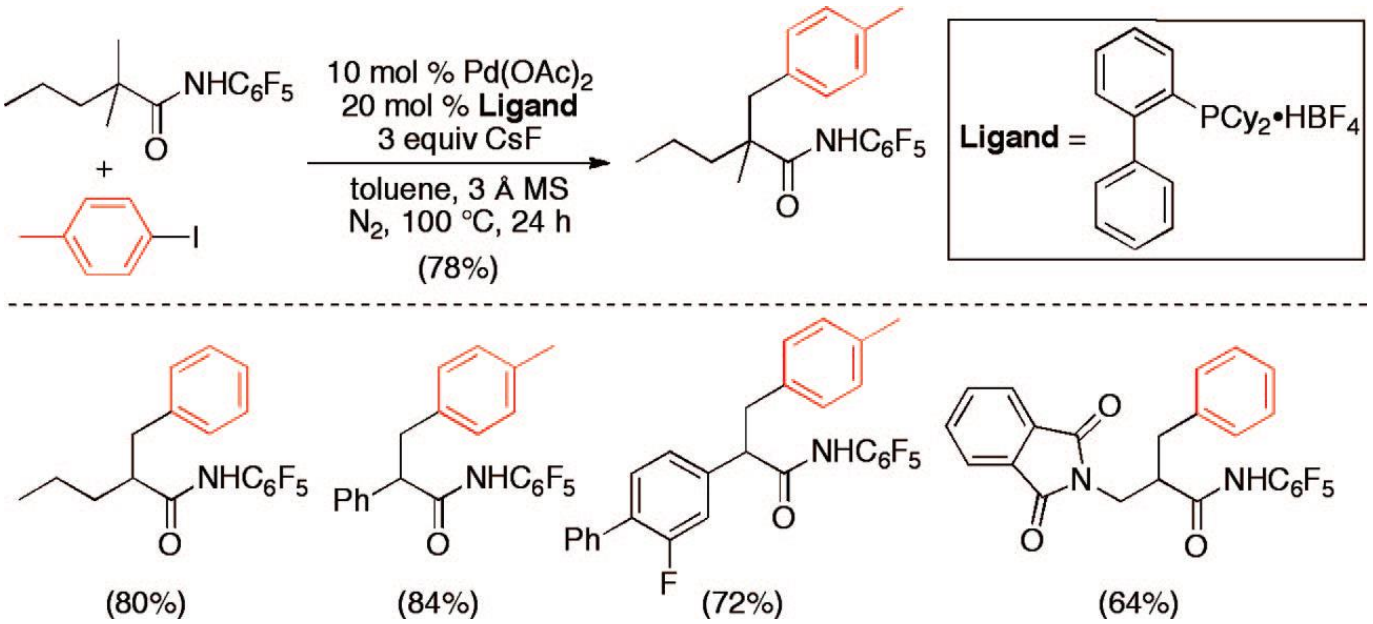

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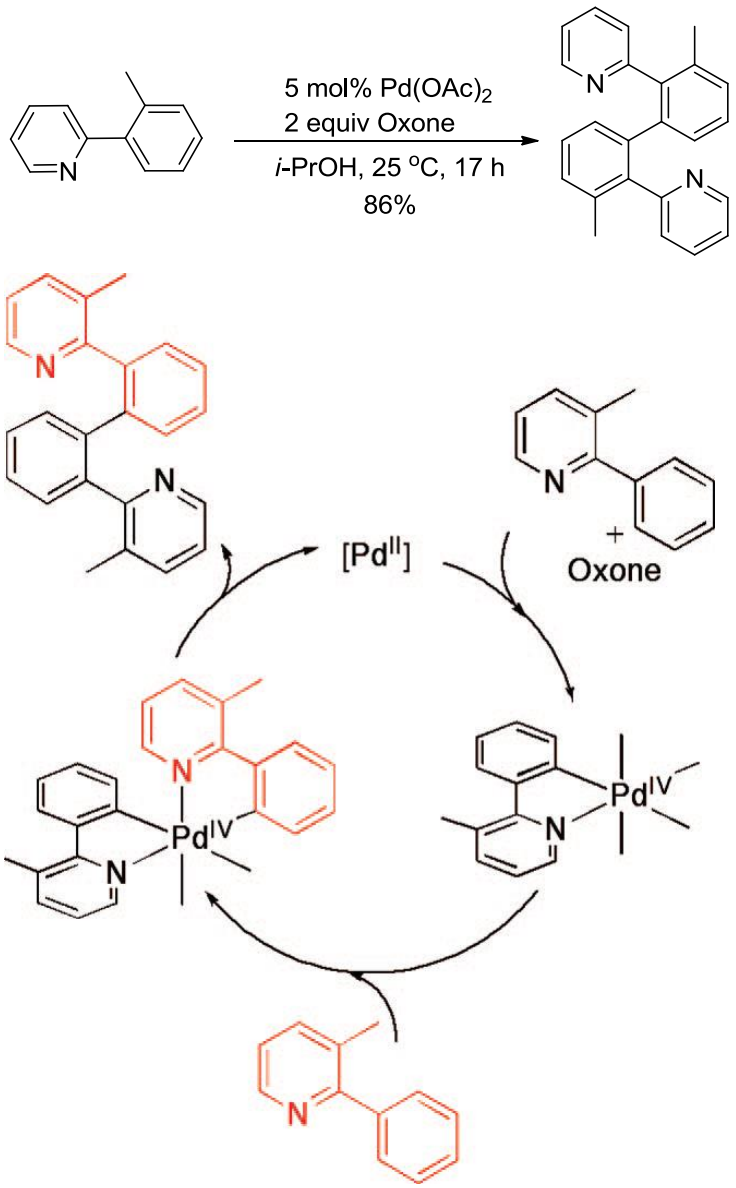

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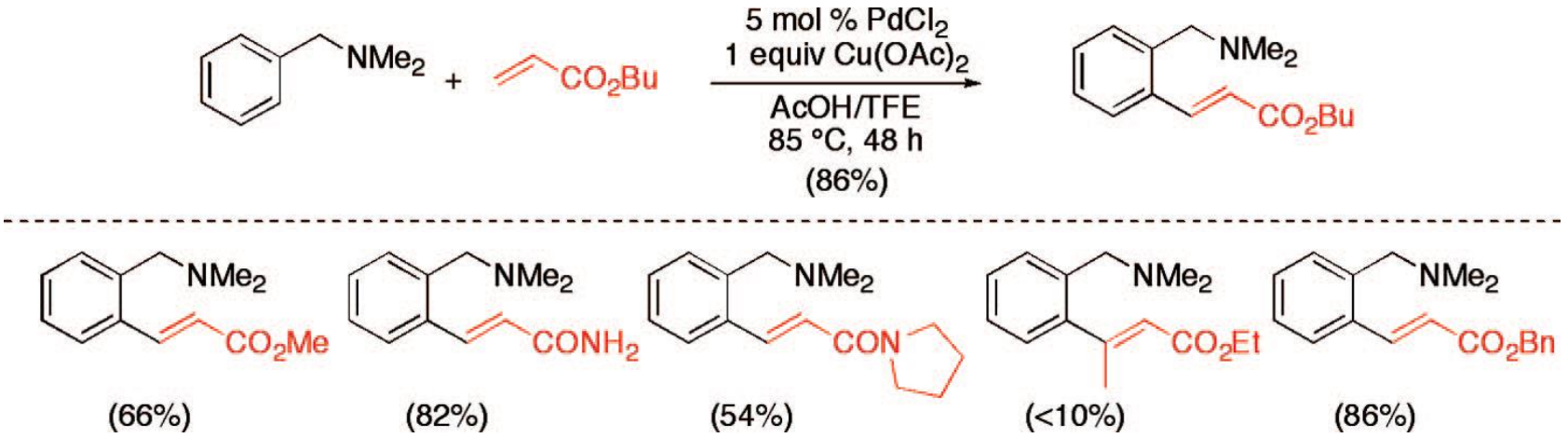

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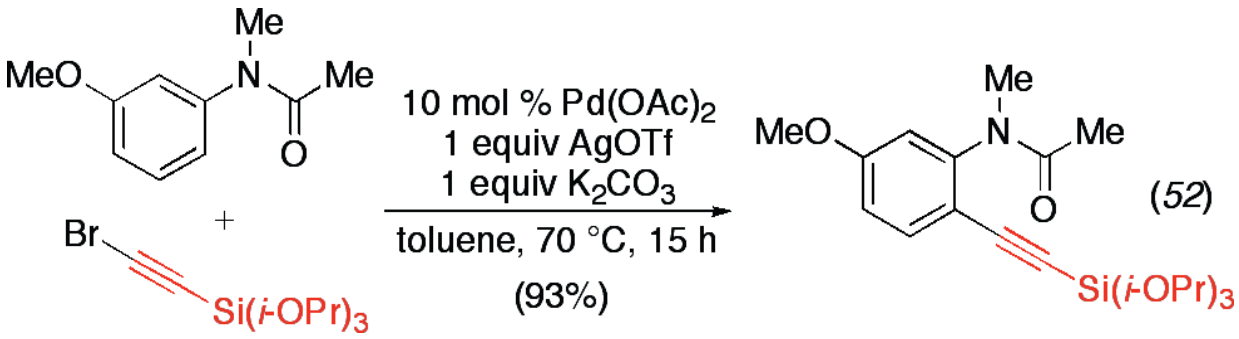

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Outlook

- New Directing Groups
- New Oxidants
- Asymmetric C-H Bond Activations

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- **Prof. Yong Huang**
- **All members of E201**

Thank you for your attention !