



## 2017-2018 POCC Lecture Series

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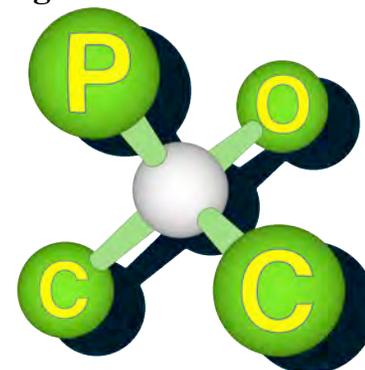
**Prof. Mary P. Watson**

University of Delaware

*Harnessing Alkyl Amines and Alkyl Alcohols for Nickel-Catalyzed Cross Couplings via C–N and C–O Bond Activation*

Carolyn Hoff Lynch Lecture Hall  
Chemistry Building, University of Pennsylvania

The Philadelphia  
Organic Chemist's Club



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Dr. Mary Watson is an Associate Professor of Organic Chemistry in the Department of Chemistry & Biochemistry at the University of Delaware. She completed an A.B. in Chemistry at Harvard University in 2000. During college, she performed undergraduate research with Prof. David A. Evans at Harvard, as well as with Prof. Kenneth B. Wagener at the University of Florida. Under the direction of Prof. Larry E. Overman, she earned a Ph.D. in organic chemistry in 2006 from the University of California, Irvine. Her doctoral thesis focused on the development and mechanistic investigation of the palladium(II)-catalyzed asymmetric allylic imidate rearrangement. During the course of this work, she had the opportunity to collaborate with Prof. Robert G. Bergman at the University of California, Berkeley, where she performed kinetic and computational studies. From 2006–2009, she was a National Institutes of Health NRSA postdoctoral fellow at Harvard University in Professor Eric N. Jacobsen's research group. During her postdoc, she developed a nickel-catalyzed method for olefin arylation via activation of C–CN bonds. In 2009 she joined the faculty at the University of Delaware, and was promoted to Associate Professor in 2016. The overarching goal of her research program is the discovery of new transition metal-catalyzed reactions of nontraditional electrophiles to facilitate the synthesis of biologically active compounds. The impact of her research has been recognized with several awards and honors, including an NSF CAREER Award (2012), a Thieme Chemistry Journal Award (2012), a Rising Star Award from the ACS Women Chemists' Committee (2013), and inclusion in the 2017 *J. Am. Chem. Soc.* Young Investigator Virtual Issue.

**Abstract:** Transition metal-catalyzed cross-coupling reactions have revolutionized organic synthesis, particularly the construction of bonds to  $sp^2$ -hybridized carbons. However, the discovery of analogous reactions of  $C_{sp^3}$  electrophiles have lagged behind, despite their potential to deliver a range of important targets, including chiral molecules in high enantiopurity. Towards solving this challenge in organic synthesis, we have developed a range of nickel-catalyzed cross-couplings of alkyl amine and alcohol derivatives. In particular, we have developed stereospecific, nickel-catalyzed cross couplings of both benzylic amine and alcohol derivatives. These reactions utilize starting materials that are readily available in high optical purity; proceed with high levels of stereochemical fidelity; employ air-stable, functional group tolerance coupling partners, such as aryl boronic acids; and display excellent functional group tolerance. This strategy is also effective for the arylation of allylic electrophiles, and the use of alternative coupling partners to enable borylations. These reactions provide a range of highly enantioenriched products with tertiary and quaternary stereocenters, including molecules important for their biological activity. We have also developed nickel-catalyzed cross-couplings of alkyl amine derivatives with non-activated alkyl groups (non-benzylic, non-allylic). This exciting new chemistry opens new opportunities for the use of alkyl amines in synthesis, and is particularly useful for late-stage functionalization of alkyl amines. The optimization, scope, and mechanistic studies of these reactions will be presented.