



Houk-Jung Organic Colloquium

Leveraging One- and Two-Electron Mechanisms in Nickel-Catalyzed Cross-Coupling

Abstract: While palladium-catalyzed cross-coupling reactions have revolutionized the construction of multi-aryl scaffolds in pharmaceutical synthesis, the reactivity of nickel in mediating radical pathways has expanded the scope of cross-coupling to include various alkyl motifs. Through our mechanistic investigations and an understanding of ligand effects, we established that strong σ -donor and π -acceptor ligands, with redox activity, facilitate nickel catalysts to initiate radical formation, capture radicals, and direct bond formation from open-shell intermediates. Given the orthogonal reactivity of radicals with polar functional groups in biomolecules, these radical pathways have introduced innovative methods for synthesizing non-canonical peptides and carbohydrates, important for drug discovery. In contrast, two-electron pathways are crucial for nickel-catalyzed bi-aryl coupling. Building on this insight, we developed a novel ligand that enhances the reactivity of nickel-catalyzed Suzuki-Miyaura couplings, paving the way for the application of nickel catalysts in pharmaceutical process synthesis.

Prof. Tianning Diao
Department of Chemistry
New York University

Thursday, April 18, 2024 | 4:00 PM
Mani L. Bhaumik Collaboratory - YH 4222
Dongwon Yoo Seminar & Conference Hall