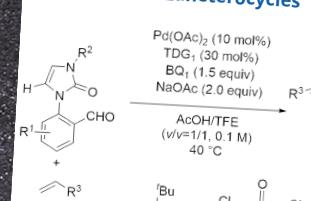


Homogeneous Catalysis Papers of the Month

November 2023

C-H activation

Activation of azaheterocycles

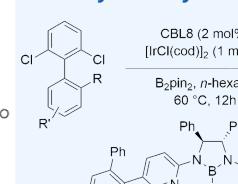


Challenge: C-N atropisomers are difficult to synthesize because they have less hindered chiral axes.

Solution: A chiral transient directing group strategy uses Pd(OAc)₂ to catalyze atroposelective C-H activation of various N-heterocycles with good enantioselectivity.

J. Sun et al., *ChemRxiv* 2023, doi: 10.26434/chemrxiv-2023-nlvwo

Ir-catalyzed borylation

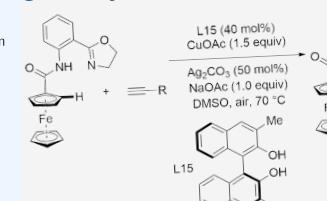


Challenge: Asymmetric C-H activation of aryl chlorides by transition metals has rarely been explored, although it may provide a milder alternative to direct metalation.

Solution: Chiral bidentate boryl ligands and [IrCl(cod)]₂ enabled the enantioselective borylation of a wide range of prochiral biaryl compounds.

H. Zhao et al., *J. Am. Chem. Soc.* 2023, doi: 10.1021/jacs.3c08129

Cu-catalyzed C-H activation



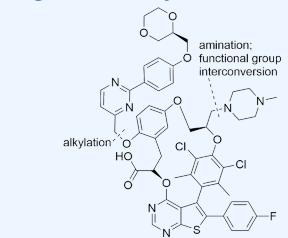
Challenge: Cu(II)-catalyzed transformations require chiral ligands to be enantioselective, but these are not prevalent.

Solution: Using an oxazoline-aniline directing group, a chiral BINOL-derived ligand, and CuOAc, enantioselective alkynylation of ferrocene derivatives has been achieved with good yield.

X. Kuang et al., *Nature Commun.* 2023, doi: 10.1038/s41467-023-43278-z

Process chemistry

Drug candidate synthesis



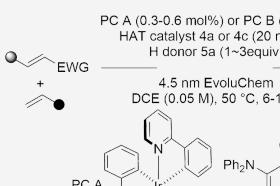
Challenge: MCL-1 inhibitor ABBV-467 contains a 17-membered macrocyclic ring structure and requires a complex synthetic strategy.

Solution: Several metal catalysts were utilized for essential cross-couplings, cleavages, and hydrogenations, including Pd₂(dba)₃/A-Phos, Pd₂(dba)₃/t-BuXPhos, Rh-Et-DuPhos, and Pd(PPh₃)₄.

P. B. Brady et al., *J. Org. Chem.* 2023, doi: 10.1021/acs.joc.3c00939

New methodology

Photoredox cross-coupling



Challenge: Intermolecular cross-coupling of olefins is incredibly important to synthetic processes.

Solution: An iridium-based photocatalyst allows reductive cross-coupling of an assortment of olefins under mild conditions, showing a high tolerance for functional groups.

W. Zhou et al., *J. Am. Chem. Soc.* 2023, doi: 10.1021/jacs.3c11285

Chromium electrocatalysis

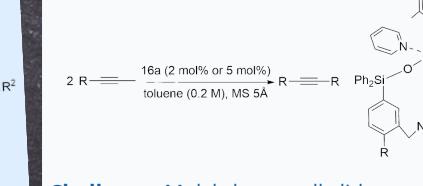


Challenge: The Nozaki-Hiyama-Kishi (NHK) cross-coupling is rarely enantioselective, especially with alkyl nucleophiles.

Solution: An electrocatalytic decarboxylative approach using Cr(III) and chiral ligands allows enantioselective NHK couplings with high functional group tolerance.

B. Jiang et al., *ChemRxiv* 2023, doi: 10.26434/chemrxiv-2023-rzx25

Mo-catalyzed alkyne metathesis



Challenge: Molybdenum alkylidyne catalysts are generally air-sensitive, and attempts to fix this often result in low functional group tolerance or toxic reaction conditions.

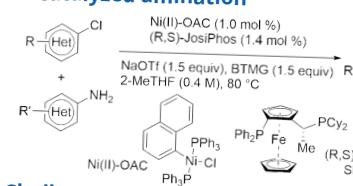
Solution: Silanolate- and pyridine-derived ligand complexes are air-stable, easy to store and handle, and accept a wide variety of functional groups under comparatively mild reaction conditions.

J. Nepomuk Korber et al., *J. Am. Chem. Soc.* 2023, doi: 10.1021/jacs.3c10430

Reviews

Non-PGM catalysis

Ni-catalyzed amination



Challenge: Nickel-catalyzed Buchwald-Hartwig couplings often involve ligands with limited availability or bases with limited solubility or functional group tolerance.

Solution: A general method for Ni-catalyzed aminations uses a dual-base strategy and a low loading of Ni(II)-OAC/Josiphos to couple aryl chlorides with anilines and aliphatic amines.

R. S. Villatoro et al., *Organometallics* 2023, doi: 10.1021/acs.organomet.3c00419

Non-precious metal catalysis

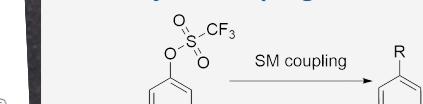


Challenge: Many recent accomplishments have been reported in the area of Ni, Cu, and Fe catalysis.

Solution: This review discusses advances in non-precious metal catalysis, including C-C, C-N, and C-O cross-couplings; borylation, C-H activation; and cross electrophile reductive couplings.

E. Chong et al., *Org. Process Res. Dev.* 2023, doi: 10.1021/acs.oprd.3c00310

Suzuki-Miyaura coupling



Challenge: Triflates and nonaflates may be a useful substitute for organohalides in Suzuki-Miyaura reactions.

Solution: This review discusses a decade of developments in triflate and nonaflate Suzuki couplings, including selectivity, chirality, Ni catalysis, photocatalysis, and various substrate molecular structures.

M. D. Innocenti et al., *Adv. Synth. Catal.* 2023, doi: 10.1002/adsc.202301124

SINOCOMPUND

Accelerate to the next phase

Selected papers from the catalysis literature published online in November 2023 (including pre-prints)