A New Class of PN3-Pincer Ligands for Metal-Ligand Cooperative Catalysis

Kuo-Wei Huang
hkw@kaust.edu.sa

Division of Chemical and Life Sciences and Engineering and KAUST Catalysis Center
King Abdullah University of Science and Technology, Thuwal 23955-6900, Kingdom of Saudi Arabia

Pincer transition metal complexes have versatile reactivities to catalyze many organic transformations and to activate strong chemical bonds. In particular, complexes with ligand derived from tridentate pyridine-based framework (L1-Py-L2) exhibit interesting reactivities. It has been demonstrated that unique bond activation reactions can be achieved through aromatization–dearomatization of the central pyridine ring. A new class of pincer ligands that have a unique disubstituted phosphinoamino (NH-PR₂) arm was prepared. Upon complexation to a transition metal and treatment of a base, a series of ruthenium, rhodium, iridium, nickel, palladium, iron, chromium, cobalt, platinum complexes have been synthesized and proven to be efficient catalysts for 1) transfer hydrogenation of ketones and imines with isopropanol, 2) dehydrogenative coupling of alcohols to esters, 3) dehydrogenative coupling of primary amines to imines, 4) hydrogenation of esters to alcohols, 5) hydrogenation of carbonates to methanol, 6) ethylene polymerization, and 7) selective 1,4-cis polymerization of 1,3-butadiene.