

Internal Webinar

Development of New Nickel-Catalyzed Metal-Ligand Cooperative Approaches for Carbon-Heteroatom Bond Formation

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This thesis work is focused on the studies of catalytic properties of some nickel complexes of a few selected redox noninnocent di- and tri-amine ligands. Two new nickel(II)-complexes of the redox noninnocent triamine pincer ligand, N1-(2-aminophenyl) benzene-1,2-diamine were synthesized, and their electronic structures and redox properties were thoroughly studied using various spectroscopic techniques. Catalytic dehydrogenation of alcohols is also described using these two complexes as catalysts. Taking advantage of the ligand centered redox processes nickel-catalyzed C-S and C-N coupling reactions were achieved under mild conditions circumventing the energetically demanding nickel-centered two-electron redox processes. Several control experiments, along with DFT studies, were performed to understand the metal-ligand cooperativity and the ligand-centered redox processes. The C-N cross-coupling protocols were further successfully extended for the synthesis of a few N-heterocycles. Nickel-catalyzed [4+2] annulation of nitriles and benzylamines via CH/N-H activation to quinazolines is described. Various substituted quinazolines were prepared in satisfactory yields via coupling of nitriles and benzylamines using the singlet di-radical catalyst.

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