

ABSTRACT

The thesis entitled " **Development of transition metal catalysts for C-H bond functionalization of aryl ketones, sulfones, and carboxamides** " presents the results obtained from the research work carried out on the development, characterization, and application of transition metal complexes and organometallic compounds as catalysts for the oxidative functionalization reactions of ketones/sulfones using alcohols and C-H bond functionalization of ferrocene/arene-carboxamide derivatives. The results obtained have been broadly divided into four parts. The *first* part describes the synthesis of α -alkylated ketones and quinolines using ketones or secondary alcohols as the starting materials and primary alcohols as green, sustainable, and abundant alkylating agents. For this reaction, a water-soluble [Ru(8-AQ)Cl(p-cymene)]Cl (8-AQ = 8-aminoquinoline) complex was used as the catalyst, and water as the reaction medium. The *second* part deals with the Pd(OAc)₂ catalyzed C(sp²)-H bond functionalization of the cyclopentadienyl ring of ferrocene using 8-aminoquinoline and picolinamide directing groups under the 'on-water' reaction conditions. The reusability of solvent and catalyst was also explored for the C-H bond arylation/alkylation reactions. The *third* part of the work describes the C(sp²)-H bond functionalization of arene and heteroarene derivatives using aryl and alkyl iodides under the 'on-water' reaction conditions. In these reactions, 8-aminoquinoline, 2-thiomethylaniline, and picolinamide directing groups were explored as bidentate directing groups, and Pd(OAc)₂ was used as the catalyst for the selective C-H bond arylation reactions. Directing group removal and late-stage functionalization reactions were also carried out in this methodology. The last and fourth part of the work deals with the synthesis of α -alkylated sulfones (branched sulfones) using benzyl alcohol derivatives as alkylating agents. For this reaction, an earth-abundant and inexpensive, (NNN)Mn(II)Cl₂ complex {NNN ligand = N-((1H-benzo[d]imidazol-2-yl)methyl)quinolin-8-amine} was used as the catalyst in toluene medium. The ligand NNN was synthesized using 8-aminoquinoline and a benzimidazole derivative.