ABSTRACT

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Title of the Thesis: "Development of Eco-compatible Catalysts and Reagents for Important Organic Reactions"

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The objective of the present study described in the aforesaid thesis was to develop eco-compatible catalysts and reagents for synthetically important organic transformations having greater merit and wider applicability compared to the conventional ones in terms of operational simplicity, improved selectivity and yield, elimination of side reactions as well as utilization of inexpensive reagents and catalysts of low toxicity. All the synthesized compounds were duly characterized with different spectroscopic and analytical techniques. Entire investigation has been divided into Four Chapters.

Chapter-I deals with the catalytic efficiency of β-cyclodextrin hydrate towards the eco-compatible synthesis of bis-(indolyl)methanes in aqueous medium by the chemoselective reaction of indoles with differently substituted aryl and alkyl aldehydes under mild reaction conditions. Furthermore, the catalytic attribute of β-cyclodextrin hydrate was explained through molecular docking and DFT studies.

Chapter-II demonstrates an economically efficient and operationally simple ligand-free protocol for the chemoselective oxidation of benzylic alcohols to carbonyl compounds using alumina-supported mesoporous nickel nanoparticles as a stable recyclable heterogeneous catalyst along with potassium *tert*-butoxide as a base in the presence of aerial oxygen as an eco-friendly oxidant. Aliphatic alcohols remained unaffected under this protocol.

Chapter-III describes eco-compatible synthesis of magnetite (Fe_3O_4) nanoparticle mediated by natural resource and its catalytic application has been explored towards an eco-friendly chemoselective reduction of nitroarenes under ambient atmosphere in aqueous medium in the presence of hydrazine hydrate as the hydrogen source. Various sensitive moieties were well tolerated during this reaction.

Chapter-IV includes the direct oxidative transformation of aldehydes to nitriles under ligand-free condition using commercially available copper acetate as an inexpensive catalyst and ammonium acetate as the source of nitrogen in the presence of aerial oxygen as an eco-compatible oxidant.

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