Abstract of the thesis

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Thesis title: Development of Novel Carboxylation Reactions and Chemoselective Transformation of Carboxylic Acids

Historically, carbon dioxide (CO_2) found many applications in organic chemistry from reaction medium e.g., super critical carbon dioxide ($scCO_2$) or CO_2-expanded liquid (CXL) system; extraction (natural products), separation (supercritical fluid chromatography); chemo-, regio-, and stereoselective transformation via the formation of transient intermediates i.e., carbonate, carbamate etc. Recently, researchers exploited CO_2 and its reduced form formic acid (HCOOH) as inexpensive, renewable, and non-toxic C1 feedstocks for carboxylation and carbonylation reactions. However, owing to its inherent kinetic and thermodynamic stability of CO_2, most of the transformations require high temperatures, high pressure, and stoichiometric amounts of organometallic reductants that leads to accidental and environmental hazards. Inspired by the natural processes, photocatalytic conversion of CO_2 into value-added products has emerged as a benign and practical approach in organic synthesis. Besides, using HCOOH as C-1 feedstock has also appeared as ever-growing research field. Mainly carboxylation reactions to synthesize carboxylic acids would be done using these two benign C-1 source.

Besides, carboxylic acids and its derivatives constitute common units in various natural products, bioactive compounds and synthetic intermediates. Upon successful attempts of producing carboxylic acids, transformation of the same would be performed using sustainable reaction conditions and new catalytic methods to produce library of pharmacophores.

The major objectives of the research work are concentrated on photocatalytic transformation of CO_2 as well as transition-metal catalyzed transformation of HCOOH to synthesize diverse range of carboxylic acids. And then we presented the transformation of carboxylic acids to achieve various type of potential bioactive compounds using sustainable catalytic methods.

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Candidate's signature 16.11.2022

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