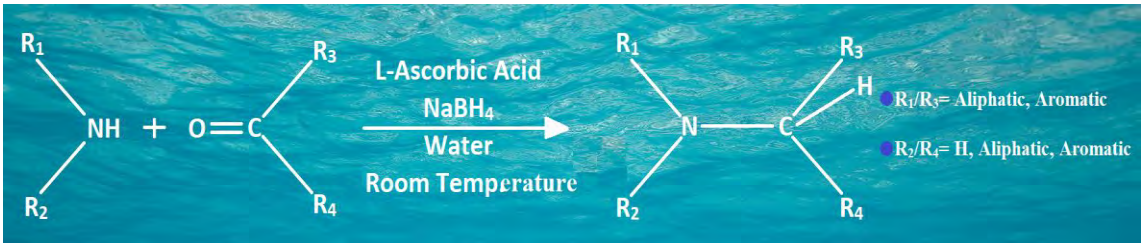
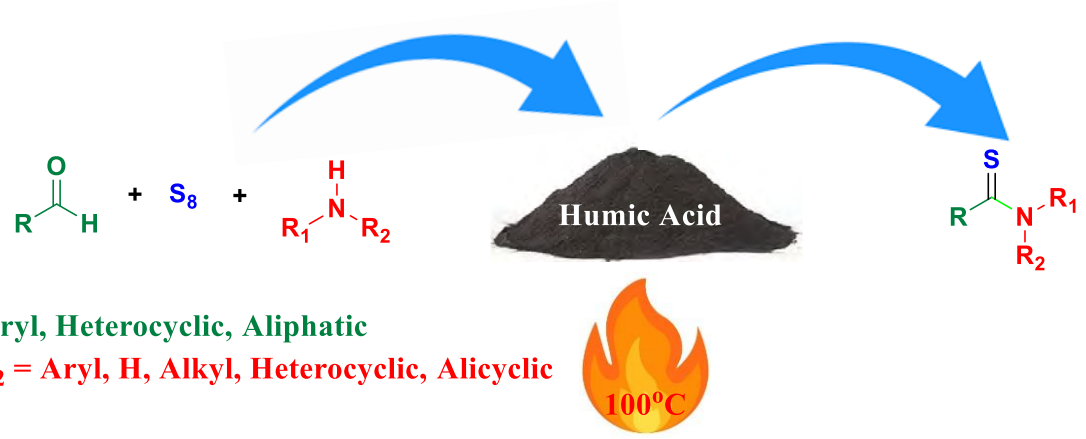
ABSTRACT

Beginning from the summer days of 2017, it took nearly five long years to finish the research work incorporated in this thesis entitled "**METHODOLOGICAL APPROACH ON CARBON-HETERO BOND FORMATION REACTION**". The work is mainly focused on development of efficient and environment benign methodologies for carbon-hereto bond formation reactions. The entire work depicted in this thesis has been divided into five chapters. In the beginning, **Chapter I** deals with a brief review on carbon-hetero bond formation reactions. Carbon-hetero bonder compounds has been extensively used in the designing of various pharmaceutically significant compounds. Apart from this, they are considered to be powerful starting materials for the construction of naturally occurring biological active compounds like amino acids, glycosides, naturally occurring heterocyclic compounds etc.

In **Chapter II** a novel, biomimetic concept for the direct reductive amination of aldehyde and ketones has been developed which uses largely available, low cost and harmless L- ascorbic acid as sustainable, versatile, non-toxic catalyst and $NaBH_4$ as a reductant. Described herein is a one-pot conversion of effortlessly accessible primary and secondary amines to biologically active higher degree amines in water at room temperature. The mild condition, environmentally benign by-products and broad scope of makes this transformation very useful.

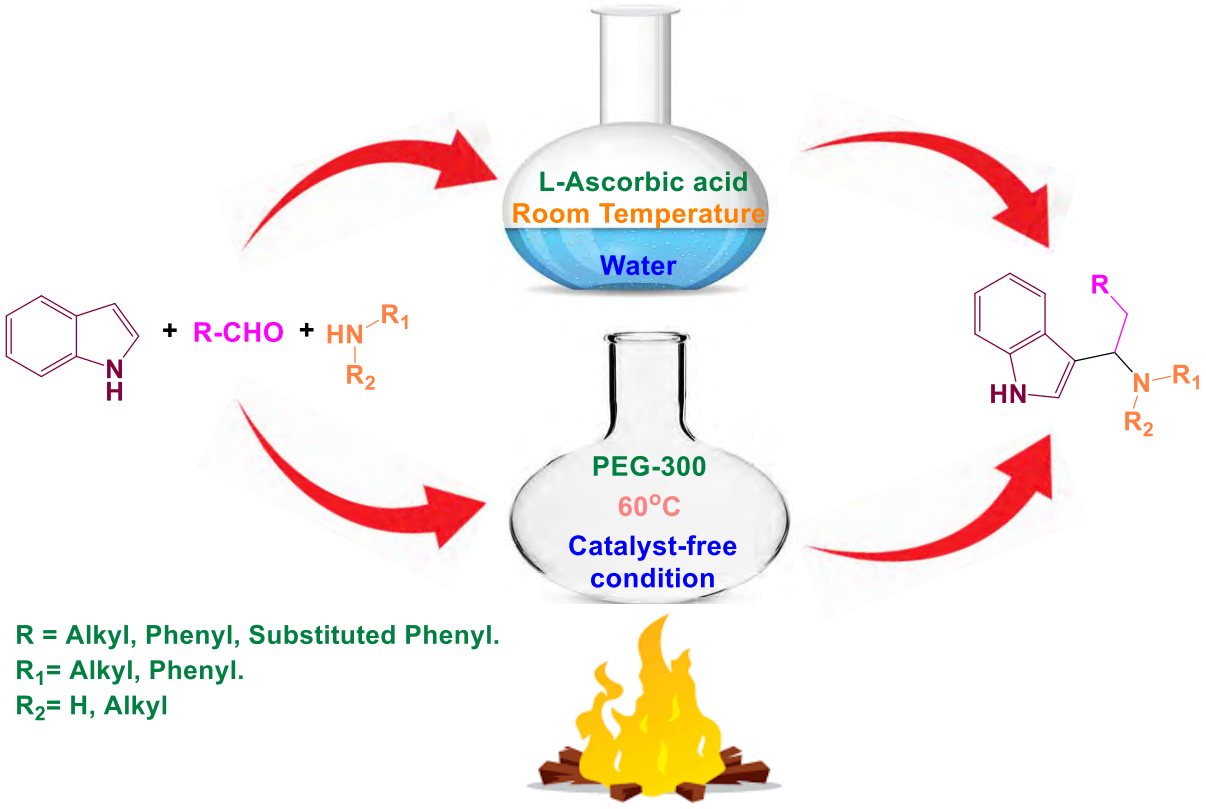


In **Chapter III** an environmentally sustainable, green synthesis of thioamide through MCR (multi component reaction) of aldehyde, amine and sulfur catalyzed by humic acid in solvent-free condition at 100 °C. The key features of this protocol are use of humic acid, a greener, easily recyclable, easily available and almost unexplored catalyst and circumvention of noxious solvents that amplify the scope of the reaction. The proposed protocol also possess tolerance to aromatic as well as aliphatic aldehydes and amines comprising variety electron donating and withdrawing functional groups.



R = Aryl, Heterocyclic, Aliphatic
R_1, R_2 = Aryl, H, Alkyl, Heterocyclic, Alicyclic

In **Chapter IV** heterocyclic molecules based on indole are valuable and important structural unit that are present in numerous biologically active natural products, agrochemicals and pharmaceuticals. In this paper a facile one-pot three component coupling of indoles, aldehydes and amines has been attained in a metal-free, economical and eco-friendly L-ascorbic acid in water medium and an alternate route has been also developed by using PEG-300 in a catalyst-free condition at 60 °C. The salient features of this process are the operational simplicity of the method, mild reaction conditions, shorter reaction time, good yield of desired product and low-cost of acid catalyst and further catalyst-free condition.



R = Alkyl, Phenyl, Substituted Phenyl.
R_1= Alkyl, Phenyl.
R_2= H, Alkyl

In **Chapter V** inexpensive, environmental benign catalyst Ethyl lactate was used in synthesis of verities of azobenzene. Oxone was utilized as the oxidant and ethanol as the solvent in this protocol. The methodology proceeds without the use of toxic metal catalyst and avoids harsh reaction conditions. A green methodology is thus reported with synthesis of good yield of the product.