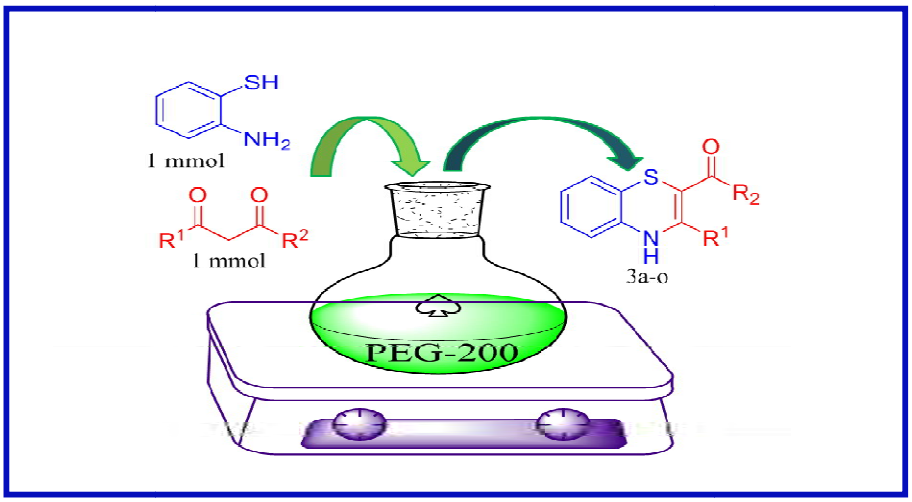
ABSTRACT

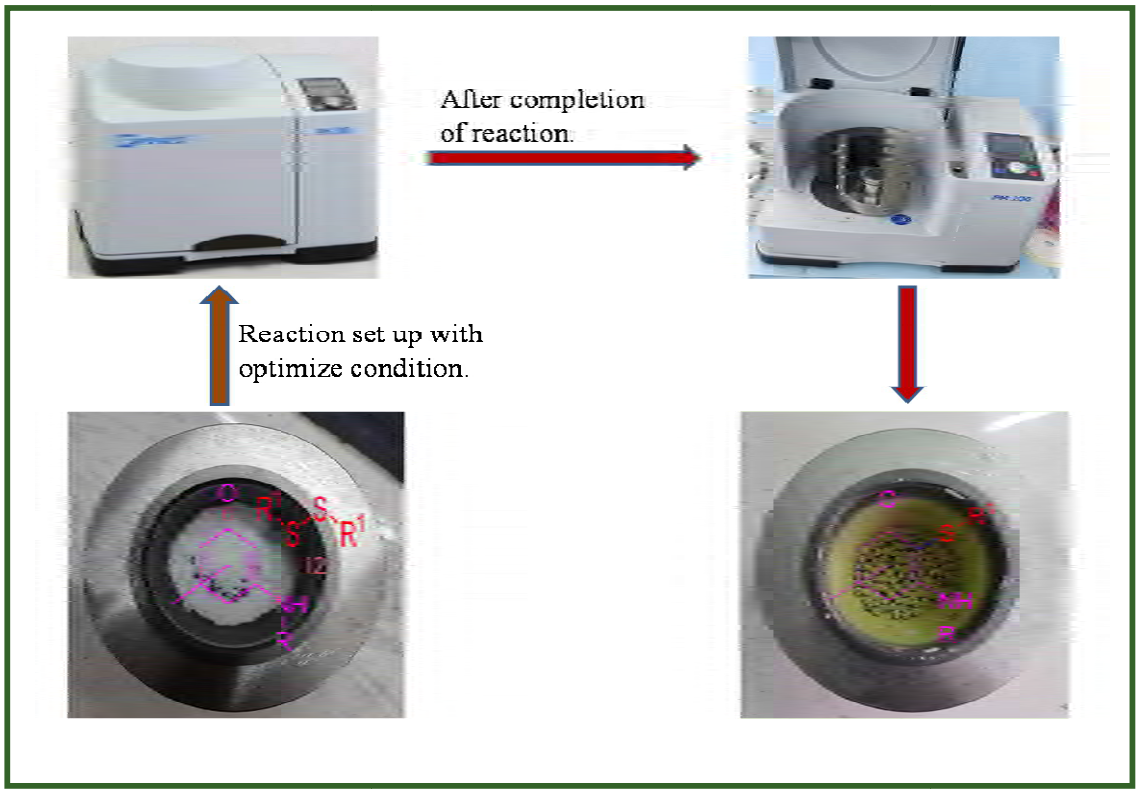
Starting from the winter of 2019, it took five long years to complete the research work incorporated in this thesis titled **"Transformative Reactions Involving Carbon-Hetero and Carbon-Carbon Bond Formations."** The work mainly focuses on developing efficient and environmentally friendly methodologies for synthetic reactions involving carbon-hetero and carbon-carbon bond formations. The entire work presented in this thesis has been divided into five main chapters.

Chapter I provides a brief review of the significance of transformative reactions involving carbon-hetero and carbon-carbon bond formations from suitable reactants. Heteroatomic bond formation reactions have been widely used in designing various pharmaceutically significant compounds. Additionally, they are considered a powerful initiation for the construction of naturally occurring biologically active compounds.

Chapter II describes a versatile, robust, and efficient strategy for synthesizing a vast range of highly functionalized 1,4-Benzothiazines derivatives through an efficient, simple, and biocompatible one-pot two-component catalyzed approach for the synthesis of bioactive and medicinally important 1,4-benzothiazine derivatives from 2-aminobenzothiols and 1,3-dicarbonyl compounds. Polyethylene glycol has proved to be a new class of green and biocompatible reaction media for metal-free organic synthesis, a non-toxic, easily available, inexpensive, unexplored, and reusable catalyst. This one-pot synthesis has several advantages, such as mild reaction conditions, shorter reaction time, good to moderate yields, and functional group tolerance, making this methodology practically feasible.



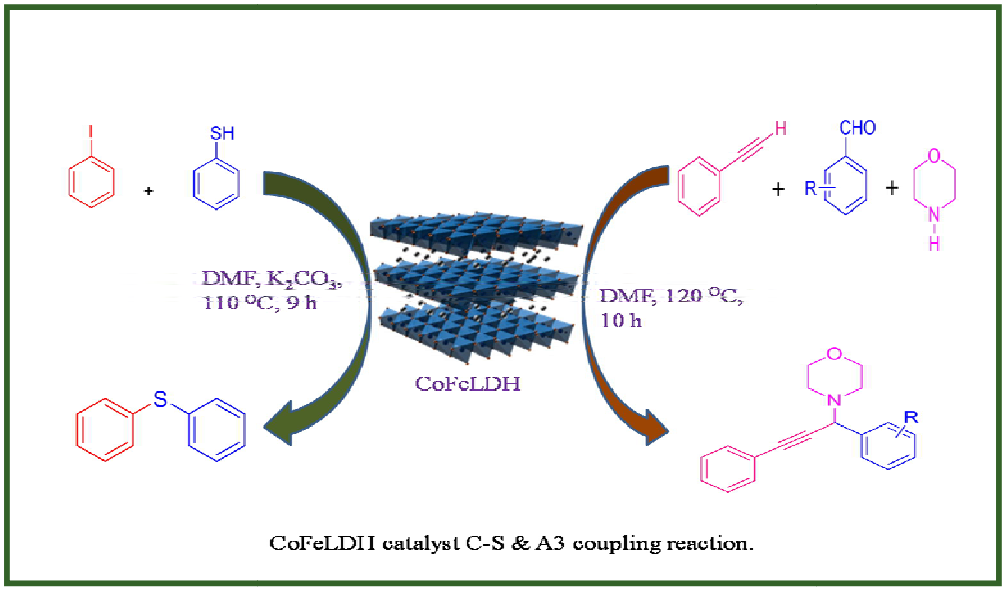
In **Chapter III**, a new and efficient method of molecular iodine-catalyzed C(Sp^2)-H sulfenylation of biologically active enaminone compounds under mechanochemical conditions and studies on their biocidal activity including molecular docking and DFT.



It has been explored as a highly proficient promoter for the metal-free one-pot four-component synthesis of a vast range of highly functionalized bioactive moieties from easily available β-enaminones. The main endeavor of this protocol is to explore this mechanochemical organic synthesis. The absence of heavy metal or toxic catalysts and harsh reaction conditions, inexpensive, greener, and environmentally safe protocol are the key advantages of this work. We have also overview the anti-microbial activities and Density functional theory (DFT) studies of synthesized compounds.

Chapter IV is divided into three sections, **Section A** deals with the synthesis of Diarylsulfide, **Section B** comprises the synthesis of propargylamine and **Section C** Studies of diaryl sulfide and propargylamine derivatives on their biocidal activity. In this chapter Layered double hydroxides (LDHs) have been recognized to act as a highly efficient catalyst for C-S bond formation and the

synthesis of propargylamine. We have also overview the anti-microbial activities, anti-diabetic activities, and Density functional theory (DFT) studies of synthesized compounds.



CoFeLDH catalyst C-S & A3 coupling reaction.

Chapter V, A new and noble method for the synthesis of pharmacological and biological important Polyhydroquinoline derivatives. In the chapter newly synthesized Cu-Schiff base complex has been recognized to act as a highly efficient catalyst for the synthesis of Polyhydroquinoline derivatives. The establishment of a new possible process for the synthesis of polyhydroquinoline derivatives, which are more productive, is accomplished under a compassionate reaction atmosphere and giving lofty product yields. The use of copper complex catalysts for this kind of evolution is still fascinating from a commercial viewpoint because copper is less toxic and inexpensive than other transition metals.