ABSTRACT OF THE THESIS ENTITLED
Transformations in Organic Compounds

SUBMITTED

BY

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Anastas and coworkers at the United States Environmental Protection Agency (EPA) were developing the concept of *benign by design* that is designing environmentally benign products and processes to address the environmental issues of both chemical products and the processes by which they are produced.

The propargylamines that result from $\text{A}^3$-coupling reactions are versatile building blocks for the organic synthesis. They are generally used as precursors for the synthesis of $N$-containing heterocyclic compounds such as pyrrolidines, oxazoles and pyrroles and also act as key intermediates for the construction of biologically active compounds like isosteres, $\beta$-lactams, oxotremorine substrates, conformationally restricted peptides and therapeutic drug molecules.

Catalysis has played a vital role in the success of the new green industry of new century and also plays a very important role for achieving clean organic synthesis. Nafion®NR50 is strongly acidic in nature, chemically and thermally stable, was found to be an excellent catalyst for a variety of major organic reactions. As a part of our ongoing program, a simple and efficient synthesis of propargylamines in excellent yields using Nafion®NR50 as a recyclable and heterogeneous solid acid catalyst has been developed.

The wide pharmacological properties such as anticancer and antibacterial have been stimulated investigation for the synthesis of dithiocarbamates derivatives. So we tried to describe a novel, highly efficient and ecofriendly method for the synthesis of these compounds using CAN as catalyst in PEG-$\text{H}_2\text{O}$ system. Ceric ammonium nitrate (CAN) has extensively employed as a water-compatible Lewis acid for C-C, C-N, C-S and C-Se bond forming reaction. Polyethylene glycol is found to be an interesting recyclable and eco-friendly solvent system in synthetic chemistry for various organic transformations with unique properties such as inexpensive, non-toxic, non-halogenated, low validity, thermal stability, commercial availability and immiscibility with a number
of organic solvents. Due to the low cost and easy handling of CAN and the green nature of recyclable PEG encouraged us to combine them together and also used for the synthesis of benzimidazoles. The environment calls on the entire research enterprises to define long-term strategies for clean chemistry and to reduce the amount of pollutants produced for the reduction of ecologically unsafe chemicals, we also described a facile and cost-effective method for the synthesis of thiohydantoin derivatives using PEG as a solvent and the abundantly available K₂CO₃ as an inexpensive catalyst. Mannich reaction is the synthesis of β-amino carbonyl compounds and is one of the most important reaction for the formation of C-C bond in organic synthesis. In our endeavour to develop a green synthesis, we have found CeCl₃.7H₂O as an efficient catalyst for the synthesis of β-amino carbonyl compounds in methanol at room temperature. Cerium(III) chlorides are relatively an effective Lewis acid catalyst as it is a water tolerant, non-toxic, inexpensive and easy to handle. Tetrahydobenzo[a]-xanthen-11-one derivatives were also synthesized by using cerium(III) chloride as catalyst in methanol at 50 °C.

Gold(III) chlorides are soft carbophilic Lewis acids, have shown extraordinary capability of activating C-C double and triple bond for an inter or intra molecular nucleophilic attack to form a new C-C and C-N bond formation reactions. On the other hand, the homogeneous mixture of PEG and gold(III) chloride (HAuCl₄.3H₂O) as a highly efficient catalytic system have been used for the synthesis of functionalized spirochromenes.

Solvent-free synthesis of nitrogen-containing heterocyclic compounds i.e. 2H-indazo[2,1-b]phthalazine-triones by dodecylphosphonic Acid (DPA) as solid Bronsted acid catalyst via Knoevenagel-Michael condensation has been developed. Dodecylphosphonic acid (DPA) is a mild, heterogeneous, recyclable and non-corrosive organic acid which act as an efficient solid surfactant type Bronsted acid catalyst for
organic synthesis. Overall, the involved methodologies fall in domain of *Green Chemistry* for the preparation of industrially important compounds.