ABSTRACT

New research is a necessity for the development as well as modernizations of human being and can be made sustainable by minimizing waste production using eco-friendly alternatives for chemical synthesis. Ionic liquid, water and carbon materials are recognized as few such alternatives to design sustainable processes. N-containing heterocycles are important organic compounds with many biological and pharmaceutical potentials and compounds like indoles, imidazoles, bis(indolyl)methanes and pyrroles have find application in various array of chemistry. Therefore synthesis of these compounds has attracted plethora of attention. Various methodologies have been reported in literature for these compounds using conventional as well as non-conventional catalysts/media. In order to increase the sustainability of the processes, we have synthesized these compounds via environmental benign methodologies using eco-friendly catalysts or media. Use of volatile organic solvents was either minimized or totally avoided during the synthesis of these compounds. The reactions were performed either in presence of ionic liquid or in presence of water or less toxic solvents such as ethanol. Preparation and characterization of the ionic liquid $\text{[EtPy]}[\text{HSO}_4]$ is described and its use for synthesis of indoles, bis(indolyl)methanes and imidazole derivatives have been explained in aqueous media and ethanol. Ionic liquid was recyclable and promotes its use for the similar related reactions.

Also, the preparation and characterization of carbon catalyst is discussed and its use for the synthesis of pyrrole derivatives is described. The catalyst is derived from pine leaves providing an example for the utilization of industrial waste. Carbon catalyst has promoted easy isolation of the product because of its heterogeneous nature and has provided a sustainable substitute for corrosive chemicals which are hard to handle during synthetic processes. We have synthesized total thirty nine derivatives including seven-hydrazone, eight -indole, seven-bis(indolyl)methane, four-imidazole and thirteen-substituted pyrrole derivatives. Additionally, other details including recycling of ionic liquid and study of the biological activity of bis(indolyl)methane derivatives have also been given in the present work.

Keywords: Sustainable chemistry, ionic liquids, aqueous media, carbon catalyst, N-heterocyclic compounds.