Abstract

The imidazolium- and pyridinium-based moieties plays a useful role in constructing a number of metal catalyst and fluorescent chemosensors. The work disclosed in the present thesis entitled **"Imidazolium- and Pyridinium-based Compounds as Potential Catalysts and Chemosensors"** deals with the synthesis of imidazolium-based compounds as ligands to synthesize metal catalysts for C-C and C-S bond formation in water. The imidazolium- and pyridinium-based compounds are also used as fluorescent chemosensors for the detection of toxic analytes in pure aqueous medium. The thesis is divided into seven chapters

Chapter 1 of the thesis describes a brief literature overview of imidazolium-based Schiff base and N-heterocyclic carbene metal catalyst including their properties and application in different organic reactions. The properties and application of imidazolium- and pyridinium-based chemosensors to detect poisonous and hazardous analytes (metal ion, anions and nitroexplosives) is also discussed in detail in this chapter.

Chapter 2 of the thesis describes the details of materials, methods and instruments used during the research work.

Chapter 3 describes the synthesis of imidazolium-based salen ligand and its nickel(II) complex and their characterization using different analytical techniques. The synthesized nickel(II) complex has been screened for its catalytic application in C-S cross coupling reaction in water under microwave irradiation and the catalyst recycled for five cycles. The catalytic mechanism is proposed using ^{1}H and ^{13}C NMR spectroscopy and mass spectrometry.

Chapter 4 presents the synthesis of imidazolium-based ligand and its abnormal NHC/CNN pincer palladium complex. The ligand and the complex is well characterized using different analytical techniques. The use of Palladium(II) complex as catalyst for the microwave-assisted Suzuki-Miyaura reaction of aryl/hetreoaryl chlorides with different boronic acids in water and its catalytic mechanism is also studied.

Chapter 5 describes the synthesis and characterization of imidazolium-based Schiff base chemosensor. The photophysical properties of proposed chemosensor and its selective and sensitive turn-on fluorescence response for Al^{3+} in pure aqueous medium is studied. Experimental data is also supported by theoretical studies. Real time application is conducted on river, tap and mineral water samples.

Chapter 6 describes the synthesis, characterization of pyridinium-based chemosensor and its application as a fluorescence turn-off chemosensor for 2,4,6-trinitrophenol (TNP) detection in pure aqueous medium. DFT calculation is also performed to support the experimental findings. TNP detection is done in real water samples and on filter paper strips.

Chapter 7 summarizes the overall thesis work conducted along with the future scope of the research work.