

## **ABSTRACT**

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**Title: "Synthesis, Structural Characterization and Spectroscopic Studies on Some Rhenium (I) Complexes"**

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This thesis comprises of work regarding the synthesis and characterization of some rhenium complexes in its +1 oxidation state incorporating different ONN and NN coordinating bidentate and tridentate ligands having Schiff base moieties.

The thesis is subdivided into five chapters elaborating methods, strategy, experimental findings and analysis of the reaction behaviour of some rhenium (I) complexes.

**Chapter I** contains summary of the work presented in this thesis with short description of the physical methods and equipment employed.

**Chapter II** describes synthesis and characterization of two rhenium (I) complexes coordinated with a multifunctional ligand in different binding mode through NNO and NN binding sites. Experimental analysis of photophysical properties of these complexes along with a detailed DFT and TDDFT calculations are provided in this chapter.

**Chapter III** mainly deals with the reactivity of a rhenium (I) complex having multifunctional ligand towards zinc acetate and cyanide ion. This chapter elaborately discuss about the nature of interaction with zinc acetate and cyanide ion. The kinetics study was performed using UV-Vis spectroscopy.  $^1\text{H}$  NMR titration was performed to elucidate the mechanism of the reaction between the complex and cyanide ion. The more important outcome of this study is that the complex is proved to be a good cyanide sensor having high detection limit.

**Chapter IV** contains synthesis and characterization of two mononuclear facial rhenium (I) complexes having two different Schiff base ligands. The ligands bind with the complex through NN binding sites. One of the complexes shows selective detection of cyanide ion. The mechanism of the reaction was interpreted by  $^1\text{H}$  NMR titration.

**Chapter V** describes synthesis and characterization of a mononuclear facial rhenium (I) complex having dibenzofuran based imine linked ligand. This complex show molecular rearrangement in presence of zinc acetate in methanolic solution. The rearranged products were studied and structural characterization was done by single crystal X-ray diffraction. The photophysical properties of these complexes were measured through UV-Vis spectroscopy and fluorescence spectroscopy.

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