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Preface

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Thiosemicarbazones have emerged as an important class of ligands over a period of time, for a variety of reasons, such as variable donor properties, structural diversity and biological applications. Interesting as the coordination chemistry may be, the driving force for the study of these ligands has undoubtedly been their biological properties and the majority of the 3000 or so publications on thiosemicarbazones since 2000 have alluded to this feature. Thiosemicarbazones with potential donor atoms in their structural skeleton fascinate coordination chemists with their versatile chelating behavior. The thiosemicarbazones of aromatic aldehydes and ketones form stable chelates with transition metal cations by utilizing both their sulfur and azomethine nitrogen as donor atoms. They have been shown to possess a diverse range of biological activities including anticancer, antitumor, antibacterial, antiviral, antimalarial and antifungal properties owing to their ability to diffuse through the semipermeable membrane of the cell lines. The enhanced effect may be attributed to the increased lipophilicity of the metal complexes compared to the ligand alone.

In order to pursue the interesting coordinating properties of thiosemicarbazones, complexes with different types of ligand environments are essential. So in the present work we chose two different ONS donor thiosemicarbazones as principal ligands. Introduction of heterocyclic bases like 1,10-phenanthroline, 2,2′-bipyridine, 4,4′-dimethyl-2,2′-bipyridine and 5,5′-dimethyl-2,2′-bipyridine, the classical N,N donor ligands leads to the

syntheses of mixed ligand complexes which can cause different bonding, spectral properties and geometries in coordination compounds. The molecular structures of these thiosemicarbazones were established by single crystal X-ray diffraction studies. The metals selected for the preparation of the complexes are vanadium, nickel, copper, zinc, cadmium and molybdenum. The crystal structures of four of the complexes were studied through single crystal XRD.

The thesis is divided into eight chapters. Chapter 1 involves a brief prologue to thiosemicarbazones and their metal complexes, bonding and coordination strategy of thiosemicarbazones and their various applications. The objectives of the present work and the various physicochemical methods adopted for the characterization of the thiosemicarbazones and their complexes are also discussed in this chapter. Chapter 2 describes the syntheses of two new aldehyde based ONS donor thiosemicarbazones and their characterization by elemental analyses, mass, FTIR, UV–vis and ^{1}H NMR spectral studies. X-ray quality single crystals of these two ligands were grown and their molecular structures were established by single crystal X-ray diffraction studies. Chapters 3-8 discuss the syntheses and characterization of oxidovanadium(IV), nickel(II), copper(II), zinc(II), cadmium(II) and molybdenum(VI) complexes derived from the thiosemicarbazones under study. A brief summary and conclusion of the work is also included in the last part of the thesis.