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Publications of the candidate
Bio data of the candidate
In the past decade, the crystal design and engineering of multidimensional arrays and networks containing transition metal complexes as nodes have achieved considerable progress. The increasing interest in this field, which involves both synthetic and theoretical chemists, physicists, crystallographers and materials scientists, is justified by the potential utility of these compounds as zeolite-like materials, catalysts or molecular electronics devises. Although numerous beautiful compounds illustrate reliable predictions of the solid-state architectures, many other interesting structures could not be predicted. However, their retrospective analysis provides the necessary information in the attempt to design intentionally inorganic or organic/inorganic hybrid materials with specific functions and properties. More recently researchers have started thinking to the extent of introducing and investigating the concept of aromaticity in the metal containing chelate rings. In recent years there is a resurgence of interest in this field probably due to the advances in synthesis, spectroscopy, crystallography and theory. It is often quoted that the concept of metalloaromaticity may play an important role in understanding organometallic mediated reactions. Ligand design is also an important area which is being developed. This topic spans the whole field, as specific ligand systems are required to “tune” the metal complex to the required function. Ligand design is important in the development of biomimics, selective metal extractants, catalysts, metal-based drugs and new materials. New ligand systems such as the cryptands and the cyclic polyethers have had a wide impact on chemistry in general. Much of modern synthetic organic chemistry depends on the use of new coordination compounds and organometallic derivatives as specific reagents.

The importance of transition metal complexes has been wide varied as homogeneous catalysts in industry, reagents in the spectroscopic determination of trace elements, and as important drugs. Among a number of transition metal complexes synthesized since the pioneering works of Werner, most of them were aimed at a biological activity which they suppose to exhibit. Later interests in this field also turned in to crystallographer’s or photochemist’s hand so as to engineer
these molecules with photonic applications or with short lived memories applicable in molecular electronics. But the biological implications of these metal complexes continued to be of interest because of the remarkable and often unexpected results in that area of research. And after decades of research people have arrived at the structure-to-activity correlation in these compounds. Among a large variety of compounds metal containing thiosemicarbazones have gained so much of interest because of their unique gamut of properties. They were known to possess antiviral, antifungal, antitumor and enzyme mimetic properties which are inimitable due to their versatile chelating behavior. The work embodied in this thesis was carried out by the author in the Department of Applied Chemistry during 2001-2003. This work stems from our interests in the biological activity as well as the structure of the metal complexes of the metal complexes of thiosemicarbazones. The incipient aim of this investigation is to probe the spectroscopic, structural and antimicrobial studies of some selected transition metal complexes of some thiosemicarbazones. We have encountered with a variety of unexpected structures during our pursuit and it was rather interesting to see the thiosemicarbazones coordinating as well as reacting with the metal ions to make little surprises in the reaction flask. The thesis has been divided in to seven chapters carrying a detailed account of our attempts to tune the ligands to react with copper, iron, manganese, gold and vanadium ions. First chapter is a small review of the recent trends observed in thiosemicarbazone’s research. Second chapter deals with the synthesis of the thiosemicarbazone ligands and their structural and spectral characterization. Antimicrobial studies of the ligands and their synthetic precursors were carried out to garnish our observations in the metal complexes. Chapter 3 deals with an array of copper complexes which really showed its power of reaction with the ligands. A number of structures were revealed whose microbial inhibitory activities are also discussed. Chapter 4 accounts the structure of iron(III) complexes along with their microbial studies. Chapters 5-7 discusses an attempt to understand the structure and spectroscopy of manganese, gold and vanadium complexes, which are rare in these types of complexes and are least studied. Throughout the work we have attempted to correlate between the observed spectroscopic, crystallographic, self-assembling and biological activities to the best of our knowledge.