

PREFACE

The transition metals are found to play an important role in chemistry, agriculture, plant nutrition, biological activity of living beings and in medicine. At the same time, the presence of these metal ions in quantities more than the optimal levels are hazardous to plants and living systems and also significantly to environmental pollution. Hence, their determination at micro levels becomes inevitable. Considering several methods for the determination of transition metal ions, at micro level, the most frequently adapted methods include using analytical techniques, such as Atomic Absorption Spectrometry(AAS), Inductively Coupled Plasma Atomic Emission Spectroscopy(ICP-AES), X-ray Fluorescence Spectroscopy, Spectrophotometry, Spectrofluorimetry and such techniques. Among these methods, generally spectrophotometric methods are preferred as they are less expensive and possess a comparable sensitivity. Though many spectrophotometric as well as extractive spectrophotometric methods are reported in the literature for the determination of almost every metal ion in the periodic table, the increasing complexity of the analyzing matrices of the real samples still necessitates a more sensitive and particularly more selective methods. The main objective of applications is to determine the trace amounts of these transition metal ions in biological and other natural samples of significant importance.

Organic compounds containing different types of functional groups have been used as analytical reagents in spectrophotometry and extractive spectrophotometry. The functional groups include carbonyl and azomethine besides others. These spectrophotometric applications are based on the metal-organic reagent chromogenic interaction.

In the present thesis, the researcher has envisaged the use of 2,6-diacetylpyridine bis-4-phenyl-3-thiosemicarbazone(2,6-DAPBPTSC) as an analytical reagent for the direct spectrophotometric determination of copper(II) and extractive spectrophotometric determination of metal ions like cobalt(II), cadmium(II), molybdenum(VI), palladium(II) and zinc(II).

A compact and comprehensive introduction about the basic principles and techniques of solvent extraction and a brief note enumerating the profundity of coordination chemistry are described in Section A of Chapter-I. Detailed literature on thio- and phenylthiosemicarbazones derived from different aldehydes and ketones and their applicability in inorganic analysis with particular reference to extractive spectrophotometry and the applicability of hydrazones in inorganic analysis with particular reference to spectrophotometry and extractive spectrophotometry are enunciated in Section B of Chapter-I. Preparation of the reagent 2,6-diacetylpyridine bis-4-phenyl-3-thiosemicarbazone(2,6-DAPBPTSC) solution, metal ion solutions and buffer solutions and instruments utilized during the present investigation are also described in Section C of Chapter-I.

The results of the studies on the spectrophotometric determination of copper(II) with 2,6-diacetylpyridinebis-4-phenyl-3-thiosemicarbazone(2,6-DAPBPTSC) is presented in Chapter-II.

The results of the studies on the extractive spectrophotometric determination of cobalt(II), cadmium(II), molybdenum(VI), palladium(II) and zinc(II) are presented in Chapter-III, Chapter(IV), Chapter(V), Chapter(VI) and Chapter(VII), respectively.

These studies include the establishment of an optimal pH and reagent concentration for stable color development in prospective analytical determination of the above said metal ions. Besides these, the studies also include the evaluation of characteristics and factors such as wavelength of maximum absorbance, applicability of Beer's law, molar absorptivity and Sandell's sensitivity. The composition of the chromogens and the stability of these metal complexes in the present research investigation are also described in the ensuing chapters. Finally, the results of the developed experimental methods for the determination of transition metal ions present in biological, water and alloy samples are incorporated in the relevant chapters.

Finally, the results obtained during the present investigations are discussed and declared in Chapter-VIII.