

CONTENTS

<u>CHAPTER (I): INTRODUCTION</u>	Page
1- 1 Literature survey on absorption spectra of azo compound	1
1- 2 Literature survey on the application of azo compound in spectrophotometric determination of metal ions	15
1- 3 Literature survey on the metal chelates of azo compound	27
1- 4 Historical development of ion exchange materials and their properties	43
1-4-1 Inorganic ion exchangers	43
1-4-2 Distribution coefficient (K_d)	44
1-4-3 Capacity	45
1-4-4 Advanced technology for the treatment of low and intermediate - level radioactive liquid waste	46
1-4-5 Chemical precipitation	46
1-4-6 Advanced of chemical treatment	47
1-4-7 Disadvantage of chemical treatment	47
1-4-8 Evaporation	48
1-4-9 Decontamination and volume reduction factor	48
1-4-10 Antimonates as inorganic ion exchangers	49

Contents

1-4-11 In-Situ precipitation of some radioactive wastes	50
in inorganic ion exchange materials	
Aim of the work	52
 <u>CHAPTER (II): EXPERIMENTAL</u>	
2- 1 Preparation of the azo dyes	54
2- 2 Preparation of dyestuff solution	56
2- 3 Preparation of universal buffer solution	56
2- 4 Working procedure:	56
2-4-1 Spectral measurements of the free ligands	56
2-4-1-1 Spectra in different solvents	56
2-4-1-2 Infrared spectra	57
2-4-1-3 ^1H NMR spectra	57
2-4-2 Preparation of solid chelates of Mn^{2+} , Fe^{3+} , Co^{2+} , Ni^{2+} , and Cu^{2+}	57
2-4-2-1 Analysis of the prepared solid chelates....	58
2-4-2-2 TGA and DTA measurements	59
2- 5 Radioactive tracers and counting equipments	60
2-5-1 Preparation of Silicon (IV) antimonates (SiSb) and MSiSb (Where $\text{M}=\text{Cs}^+$, Co^{2+} and Eu^{3+})	60

Contents

2-5-1-1 Chemical In-Situ Precipitation of Some Radwaste Elements With Silicon (IV) Antimonate (MSiSb)	60
2-5-2 Characterization of the prepared materials	61
2-5-2-1 Chemical Stability	61
2-5-2-2 X-Ray diffraction Patterns and Infrared spectra	61
2-5-3 Ion exchange behavior of the prepared materials	61
2-5-3-1 Capacity of the prepared materials for Cesium and cobalt ions.....	61
2-5-3-2 Distribution coefficient of Cs^+ and Co^{2+} between the prepared materials and aqueous solution	62

CHAPTER (III): Result and Discussion

The spectral characterization of the azo compounds	64
3-1 The electronic absorption spectra in organic solvents	64
3-1-1 The electronic absorption spectra in ethanol	64
3-1-2 The electronic absorption spectra in different organic solvents	67
3-2 The spectra behavior of some azo compounds	68

Contents

under investigation in buffer solutions and the determination of their ionization constants	75
--	----

3-3 Infrared spectra of the azo compounds	79
---	----

3-4 ^1H NMR spectra of the free ligands	82
--	----

CHAPTER (IV): Characterization of the metal chelates with azo compounds

4-1 Studies of the metal chelates in solution	85
---	----

4-1-1 Conductometric studies	85
------------------------------------	----

4-1-2 Spectrophotometric studies of metal complexes in solution	88
--	----

4-2 Studies of the solid metal chelates	105
---	-----

4-2-1 The elemental analysis	105
------------------------------------	-----

4-2-2 Molar conductivities of some metal chelates	105
---	-----

4-2-3 Thermogravimetric and differential thermal analysis of metal chelates	107
--	-----

4-2-4 Infrared absorption spectra of the solid metal chelates	111
--	-----

4-2-5 Electronic absorption spectra and magnetic moments of the solid metal chelates	115
---	-----

4-2-6 The spectrophotometric determination of	
---	--

Contents	
metal ions	123
4-3 Characterization of all chemical in-situ precipitates	
MSiSb (where M= Cs^+ , Co^{2+} , and Eu^{3+})	125
4-3-1 Chemical stability	125
4-3-2 Structure features	125
4-3-3 Apparent capacity	126
4-3-4 Distribution studies	128
GENARAL DISCUSSION	130
SUMMARY	139
REFERENCES	146
ARABIC SUMMARY	