

CONTENTS

No		Page
1.	INTRODUCTION	1
2.	REVIEW OF LITERATURE	4
2.1.	Arsenic in water.....	4
2.2.	Arsenic in soil	5
2.2.1	Available arsenic	7
2.2.2	Exchangeable arsenic.....	8
2.3.	Sorption of arsenic in soils.....	9
2.3.1	Effect of pH on adsorption of arsenic.....	11
2.3.2	Sorption of arsenic by clay minerals.....	16
2.3.3	Adsorption of arsenic on goethite.....	17
2.4.	Competition of arsenic in soils.....	19
2.4.1	Competition between arsenic and phosphate in soils.....	19
2.5.	Desorption of arsenic in soils, oxides, and clay minerals	21
2.5.1	Desorption of arsenic by phosphate	22
2.6.	Removal of arsenic	23
2.7.	Sorption of cadmium by soils, oxides, and clay minerals	23
2.7.1	Adsorption isotherms of cadmium by soils, oxides, and clay minerals	29
2.7.2	Effect of pH on cadmium adsorption by soils, oxides, and clay minerals.....	29
2.8.	Competition of cadmium adsorption on soils, oxides, and clay minerals.....	33
2.9.	Desorption of cadmium from soils, oxides, and clay minerals.....	34
3.	MATERIALS AND METHODS.....	40
3.1	Experiment I (adsorption isotherms).....	46
3.1.1	Experiments of adsorption isotherms of As and Cd on different adsorbents.....	46
3.1.2	Experiment II Adsorption envelopes (adsorption versus pH).....	47
3.1.3	Experiment III (Competition).....	48
3.1.4	Experiment IV (Adsorption kinetics).....	49
3.1.5	Experiment V (Arsenic and Cadmium desorption).....	50
3.2.	Application of adsorption isotherms equations.....	51
3.2.1	Langmuir adsorption isotherms.....	51
3.2.2	Freundlich equation.....	51
3.3.	Methods of analysis	52

3.3.1	Soil analysis	52
3.3.2	Synthesis of goethite	53
4.	RESULTS AND DISCUSSION	54
4.1.	Survey of the occurrence of As and Cd in the selected waters and soils	54
4.2.	Laboratory studies	58
4.2.1	Experiment I: Adsorption isotherms of arsenic and cadmium on different adsorbents	58
4.2.1.1	Soils	58
4.2.1.2	Goethite	69
4.2.1.3	Zerovalent iron	83
4.2.2	Experiment II: Adsorption envelopes (adsorption versus pH)	99
4.2.2.1	Soil	99
4.2.2.2	Goethite	100
4.2.2.3	Zerovalent iron	103
4.2.3	Experiment III: Competitive adsorption of arsenate with phosphate, molybdate, selenate, and sulfate on goethite and zerovalent iron (ZVI)	109
4.2.3.1	Goethite	109
4.2.3.2	Zerovalent iron	121
4.2.4	Experiment IV: Kinetics of arsenic adsorption	134
4.2.4.1	Goethite	134
4.2.4.2	Zerovalent iron	135
4.2.5	Experiment V: Desorption of arsenic and cadmium from soils by DTPA	142
4.2.5.1	Soil	142
4.2.5.2	Goethite	144
4.2.5.3	Zerovalent iron	154
5.	SUMMARY	160
6.	REFERANCE	175