

TABLE OF CONTENTS

<i>Contents</i>	<i>Page No.</i>
Abstract	i
Declaration of Academic Integrity	vi
Certificate from Supervisor	vii
Certificate from Co-Supervisor	viii
Acknowledgment	ix
Table of Contents	x
Abbreviations and Symbols	xvi
List of Figures	xxi
List of Schemes	xxvii
List of Tables	xxviii

Chapter 1. Introduction

1.1 Polymers	1
1.1.1 Polymeric gels	2
1.2 Organogels	4
1.2.1 Types of organogels	5
(a)Physical organogel	5
(b) Chemical organogel	6
(c) Hybrid organogel	6
1.2.2 Crosslinking involved in organogels	8
1.2.2.1 Crosslinking forming physical gels	8
1.2.2.2 Crosslinking forming chemical gels	9
1.2.3 Properties of organogels	9
1.2.4 Factors affecting the formation of organogels	11
1.2.4.1 Solvents	12
1.2.4.2 Organogelators	13
(a) Low molecular weight organogelator	14
(b) Polymeric organogelator	15

1.2.4.3 Temperature and concentration	15
1.3 Mechanism of organogel formation	16
1.3.1 Fluid matrix fiber mechanism	16
1.3.2 Solid matrix fiber mechanism	17
1.3.3 Polymeric matrix mechanism	18
1.3.4 Emulsion matrix mechanism	18
1.4 Organogel for water purification	19
1.4.1 Organogel for dye adsorption	20
1.4.2 Organogel for metal adsorption	22
1.4.3 Organogel for solvent absorption	22
1.5 Other applications of organogel	24
1.5.1 Organogels in drug delivery	25
1.5.2 Mechanically durable organogel	25
1.5.3 Responsive organogel	25
1.5.4 Conductive organogel	26
1.5.5 Organogel as sensor	26
1.5.6 Organogel exhibiting wettability	26
1.6 Scope and objectives	27
1.7 References	28

Chapter 2. Removal of organic solvents through a fatty acid grafted polyvinyl alcohol based organogel

2.1 Introduction	40
2.2 Experimental	41
2.2.1 Materials	41
2.2.2 Preparation of organogels	42
2.2.3 Characterization	43
2.2.3.1 Fourier transform infrared analysis	43
2.2.3.2 Scanning electron microscopy	43
2.2.3.3 X-ray diffractometer analysis	43

2.2.3.4 Thermogravimetric analysis	44
2.2.3.5 Differential scanning colorimetry analysis	44
2.2.3.6 Contact angle & Rheology	44
2.2.4 Absorption/Swelling analysis	44
2.2.5 Absorption/Swelling kinetics	45
2.2.6 Desorption kinetics	45
2.2.7 Reusability	45
2.3 Results & Discussion	46
2.3.1 Synthesis of organogels	46
2.3.2 Characterization of organogels	46
2.3.2.1 FT-IR analysis	46
2.3.2.2 Morphological analysis	47
2.3.2.3 XRD analysis	47
2.3.2.4 TGA analysis	48
2.3.2.5 DSC analysis	49
2.3.2.6 Rheological study	50
2.3.3 Application in solvent absorbency	51
2.3.4 Absorption & Desorption kinetics	53
2.4 Conclusion	54
2.5 References	55

Chapter 3.

SECTION A - Grafted polymeric organogel as an effective medium for removal of cationic dyes and organic pollutants from contaminated water

3.1 Introduction	60
3.2 Experimental section	62
3.2.1 Materials	62
3.2.2 Preparation of the organogel	62
3.2.3 Characterization	64
3.3 Results & Discussion	64

3.3.1 Preparation and characterization of organogel	64
3.3.1.1 FT-IR analysis	65
3.3.1.2 Morphological analysis	66
3.3.1.3 Thermal analysis	67
3.3.1.4 XRD & Rheological analysis	69
3.3.2 Swelling analysis	69
3.3.2.1 Swelling kinetics of solvent	71
3.3.2.2 Reusability of solvent	72
3.3.3 Dye adsorption	73
3.3.3.1 Study of mixed dyes	76
3.3.3.2 Kinetics of adsorption	77
3.3.3.3 Adsorption isotherm	79
3.3.3.4 Mass transfer model	81
3.3.3.5 Mechanism of adsorption	83
3.3.3.6 Reusability of organogel	84
3.4 Conclusion	86
3.5 References	86

SECTION B - Polymeric organogel as an effective approach for removal of heavy metal ions from water through adsorption stratagem

3.6 Introduction	93
3.7 Experimental section	95
3.7.1 Materials	95
3.7.2 Preparation of organogel	95
3.7.3 Characterization	96
3.8 Results & Discussion	96
3.8.1 Morphological and EDX analysis	96
3.8.2 FT-IR analysis	98
3.8.3 Adsorption of metal ions	99
3.8.4 XPS analysis	101

3.8.5 Study of pH	103
3.8.6 Kinetics of adsorption	104
3.8.7 Adsorption isotherm	105
3.8.8 Model of mass transfer	108
3.8.9 Mechanism of adsorption	109
3.9 Conclusion	111
3.10 References	112

Chapter 4. Aluminum montmorillonite/polyaniline hybrid composite-based PVA organogel for removal of carcinogenic chlorophenols and congo red dye from contaminated water

4.1 Introduction	119
4.2 Experimental Section	121
4.2.1 Materials	121
4.2.2 Preparation of organogel	122
(i) Synthesis of hybrid Clay-PAni composite	122
(ii) Preparation of PVA-hybrid composite organogel	122
4.2.3 Characterization	124
4.3 Results & Discussion	124
4.3.1 Characterization investigation	124
4.3.1.1 HRXRD analysis	124
4.3.1.2 FT-IR analysis	125
4.3.1.3 Morphological study	125
4.3.1.4 BET analysis	126
4.3.1.5 Thermogravimetric study	127
4.3.1.6 Mechanical study	128
4.3.2 Solvent uptake	129
4.3.2.1 Kinetics of swelling	131
4.3.3 Dye adsorption	132
4.3.3.1 Effect of adsorbent dosage	133
4.3.3.2 Effect of dye concentration	134

4.3.3.3 Effect of pH	134
4.3.3.4 Effect of contact time	135
4.3.3.5 Selective mixture of dyes	135
4.3.3.6 Adsorbent reusability	136
4.3.3.7 Adsorption kinetics	137
4.3.3.8 Adsorption isotherm	138
4.3.3.9 Intra-particle diffusion study	139
4.3.3.10 Mechanism of adsorption	139
4.4 Conclusion	142
4.5 References	142

Chapter 5. Conclusion & Future prospects

5.1 Conclusion	149
5.2 Future scopes	151

Annexure

A. List of publications	A1
B. List of conferences	A3
C. List of seminars/workshops	A3