

CONTENTS

Certificate

Acknowledgement

Abstract

1. Introduction

1.1 Hydrogel	1-2
1.2 Characteristics of hydrogels	3
1.3 Clay mineral	3-4
1.3.1 Organically modified clay minerals	4
1.4 Copolymerization	4-6
1.5 Types of hydrogels	6-7
1.6 Methods for preparation of hydrogels	
1.6.1 Solution copolymerization/crosslinking	7-8
1.6.2 Suspension and emulsion polymerization	8
1.6.3 Crosslinking of polymers	8-9
1.6.3.1 Crosslinking by chemical reactions with aldehyde	9
1.7 Factors affecting the swelling of ionic hydrogels	
1.7.1 Effect of ionic content	9-10
1.7.2 Nature of polymer	10
1.7.3 Ionization equilibrium consideration	10-11
1.7.4 Ionic interactions	11-12

1.7.5 Nature of counter ions	12
1.7.6 Electrostatic attraction	12
1.8 Thermodynamics of polymer hydrogels	13
1.9 Poly (vinyl alcohol)	13
1.10 Acrylic acid	13
1.11 Organo modified nanoclay (Montmorillonite)	14
1.12 Applications of hydrogels	14-16
2. Literature survey	17-19
3. Objective and Plan of work	
3.1 Objective of the work	20
3.2 Plan of the work	20-21
4. Experimental	
4.1 Materials used for the work	22-23
4.2 Preparation of organophillic clay	23
4.3 Synthesis of poly(vinyl alcohol)-g-polyacrylic acid/MMT nanocomposite hydrogels	24
4.4 Characterizations	
4.4.1 FTIR analysis	25
4.4.2 XRD analysis	25
4.4.3 SEM analysis	25
4.4.4 Swelling studies	25

4.4.5 TG analysis	25-26
4.4.6 Cytotoxicity by Haemolytic Potentiality Test	26
5. Results and Discussions	
5.1 FTIR spectra	27-29
5.2 XRD analysis	29-30
5.3 SEM analysis	30-31
5.4 Swelling studies	31-32
5.5 TG analysis	33
5.6 Cytotoxicity Assay	34
6. Conclusion	35
7. Future Scope	36
8. References	37-38

LIST OF FIGURES

<u>Figure No.</u>	<u>Page No.</u>
Figure 1.1: 3D crosslinked hydrogel structure	1
Figure 1.2: (i) Step by step swelling of a hydrogel	2
(ii) Dried and a swollen hydrogel	2
Figure 1.3: Applications of hydrogels	15
Figure 4.1: Scheme of the preparation of PVA-g-PAA/MMT nanocomposite hydrogel	24
Figure 5.1: FTIR spectra of MMT clay	27
Figure 5.2: FTIR spectra of PVA-g-PAA copolymer	27
Figure 5.3: FTIR spectra of PVA-g-PAA/ MMT nanocomposite hydrogels	28
Figure 5.4: (a) XRD spectra of native gel	29
(b) XRD spectra of MMT nanoclay	29
(c) PVA-g-PAA/MMT nanocomposite hydrogel	29
Figure 5.5: (a) SEM micrograph of Pure PVA-g-PAA hydrogel	30
(b) SEM micrograph of PVA-g-PAA/MMT hydrogel Nanocomposites	30
Figure 5.6: Swelling behaviour with the variation of crosslinker amount	31

Figure 5.7: Swelling behavior with the variation of clay (MMT) amount	32
Figure 5.8: (a) TGA curves of PVA-g-PAA hydrogel	33
(b) TGA curves of PVA-g-PAA/MMT nanocomposite	
Hydrogel	33
Figure 5.9: Bar diagram showing the percentage of haemolytic activity	
by different samples at concentration (10 mg/2ml) at 540 nm	34