

CONTENTS

Chapter 1: Introduction

1.1 Background.....	1
1.1.1 Sustained or controlled drug delivery systems	2
1.2 Polysaccharide and its contribution in human life:.....	4
1.3 Biopolymers and its application in biomedical field.....	4
1.3.1 Chitin.....	5
1.3.2 Chitosan	5
1.3.3 Dextran.....	6
1.3.4 Cellulose.....	7
1.3.5 Hyaluronic acid.....	7
1.3.6 Alginate.....	8
1.3.7 Pullulan	9
1.3.8 Chondroitin sulphate.....	10
1.3.9 Problems with the existing polymers as drug delivery vehicle.....	11
1.3.9.1 Functionalization of polymer to improve the property	11
1.3.9.2 Atom Transfer Radical Polymerization (ATRP).....	12
1.3.9.3 Reversible Addition-Fragmentation chain-Transfer (RAFT) Polymerization	13
1.3.9.4 Nitroxide-mediated Polymerization (NMP).....	15
1.3.9.5 Grafting: A versatile approach to modify polymers.....	15
1.4 Mechanism of drug release from polymeric network.....	16
1.5 Polymeric Drug delivery systems.....	18
1.5.1 Micelles	18
1.5.2 Dendrimers	19
1.5.3 Liposomes	21
1.5.4 Nanoparticle	22
1.5.5 Hydrogel.....	23
1.5.6 Scaffold	25
1.6 Chitosan as a drug delivery vehicle: A brief overview.....	26
1.6.1 Tablets	27
1.6.2 Beads	28
1.6.3 Films.....	28
1.6.4 Nanofibers	29

1.6.5 Hydrogels.....	31
1.6.6 Nanoparticles	32
1.7 Scope of the present work	33
1.8 Objective of the present thesis.....	35
Chapter 2: Experimental Section	
2.1 Synthesis.....	37
2.1.1Materials	37
2.1.1.2 Synthesis of PU-graft-Chitosan	37
2.1.1.3 Synthesis of Polyurethane-Chitosan brush	38
2.1.1.4 Preparation of Hydrogel and Scaffold	40
2.2 Characterization.....	40
2.2.1 Nuclear Magnetic Resonance Spectroscopy (NMR).....	41
2.2.2 Fourier Transform Infrared Spectroscopy (FTIR).....	42
2.2.3 UV-Visible Spectroscopy (UV-visible).....	42
2.2.4 X-ray Diffraction (XRD)	42
2.2.5 Morphological investigation.....	42
2.2.6 Thermal Study	43
2.2.7 Mechanical behavior.....	43
2.2.8 Contact Angle	44
2.2.9 Swelling and Deswelling study	44
2.2.10 Drug Release assay	45
2.2.11 Bio-and Hemocompatibility	45
2.2.11.1 Platelet preparation	45
2.2.11.2 Platelet aggregation studies	46
2.2.11.3 <i>In vitro</i> hemolysis study	46
2.2.11.4 Platelet adhesion	46
2.2.11.5 MTT assay	47
2.2.11.6 Measurement of intracellular ROS	47
2.2.11.7 <i>In vitro</i> cell line studies	48
2.2.11.7.1 Cell culture	48
2.2.11.7.2 Cell viability	48
2.2.11.7.3 Fluorescence studies	49
2.2.12Antibacterial activity study	49

2.2.13 Animal Study	49
2.2.13.1 Animal	49
2.2.13.2 Absorption and tissue distribution study of CHT and PU-graft-CHT (CHT20)	50
2.2.13.3 <i>In vivo</i> gelation study	51
Chapter 3: Polyurethane-grafted-chitosan for controlled drug delivery	
3.1 Introduction.....	51
3.2 Results and discussions.....	53
3.2.1 Evidence of grafting.....	53
3.2.2. Effect of grafting on hydrophilicity	57
3.2.3 Effect of grafting in thermal and mechanical properties.....	59
3.2.4 Controlled drug delivery	63
3.2.5 Chemically modified Chitosan as biomaterial.....	67
3.2.6 Erythrocyte membrane integrity and cytotoxicity of graft copolymer	69
3.2.7 Absorption of graft copolymer (CHT20) in Blood	72
3.2.8 Distribution of absorbed CHT20 in the organs.....	73
3.3 Conclusion	75
Chapter 4: Polyurethane-chitosan based brush copolymer as injectable hydrogel for controlled drug delivery	
4.1 Introduction.....	77
4.2 Results and discussion.....	80
4.2.1 Formation of brush copolymer and interactions	80
4.2.2 Gelation and morphology of graft brush copolymer.....	84
4.2.3 Mechanical responses of hydrogel and scaffold- graft density dependency.....	87
4.2.4 In vitro controlled drug release	89
4.2.5 Cytotoxicity.....	94
4.2.6 <i>In vivo</i> gelation study in rat model	96
4.3 Conclusion	97
Chapter 5: Chitosan nanocomposite hydrogel and scaffold for controlled drug delivery	
5.1 Introduction.....	99
5.2 Results and discussion:	100
5.2.1 Extent of dispersion and interaction in naohybrids	100

5.2.1 Extent of dispersion and interaction in naohybrids	100
5.2.2Morphology and the mechanical response	102
5.2.3 Sustained drug delivery	106
5.2.4 Biocompatibility Test	110
5.3 Conclusion.....	112

Chapter 6: Conclusion and Future Scope of the work

6.1 Conclusion.....	115
6.2 Future Scope of the work	119
References	121