

Contents	Page No.
Title page	i
Dedication	ii
Declaration	iii
Certificate by the supervisor	iv
Acknowledgement	v
List of abbreviations	vi
List of symbols	vii
Abstract	viii
Contents	ix-xi
Chapter 1: Introduction	1-23
1. Polymer	2
1.1. Harmful effects of synthetic polymers	2
1.2. Biodegradable polymers	3
1.2.1. Chitin	3
1.2.2. Chitosan	5
1.3. Conversion of chitin to chitosan	7
1.4. Modification of chitosan	7
1.4.1. Chemical modification of chitosan with 2-Bromopropionyl bromide	8
1.4.2. Modification of chitosan by incorporation of clays	9
1.4.2.1. Kaolin clay	10
1.4.2.2. Bentonite clay	10
1.4.2.3. Silica clay	11
1.5. Literature review	12
1.5.1. Chemical modification of chitosan	12
1.5.2. Chitosan/clay composites	14
1.5.2.1. Chitosan/kaolin clay composites	15
1.5.2.2. Chitosan/bentonite clay composites	15
1.5.2.3. Chitosan/silica clay composites	17
1.6. Scope and objectives	20
Chapter 2: Experimental and characterization techniques	24-32
2.1. Materials	25
2.2. Characterization techniques	25

2.2.1. Instrumental measurements	25
2.2.1.1. Fourier transform infrared spectroscopy	25
2.2.1.2. Ultraviolet/Visible spectroscopy	26
2.2.1.3. Nuclear magnetic resonance	27
2.2.1.4. X-Ray diffraction pattern	27
2.2.1.5. Scanning electron microscopy	28
2.2.1.6. Universal testing machine	28
2.2.1.7. Thermogravimetric analysis	29
2.2.1.8. Differential scanning calorimetry	30
2.2.2. Antibacterial activity	30
2.2.2.1. By agar well diffusion method	30
2.2.2.2. By microdilution method	31
2.2.3. Swelling study	31
2.2.4. Computational methods	32

Chapter 3: Experimental and theoretical study of chemical modification of chitosan

33-51

3.1. Introduction	34
3.2. Synthesis	35
3.2.1. Chemically modified chitosan	35
3.2.2. Crude sample for antibacterial study	36
3.3. Results and discussion	36
3.3.1. Structural evaluation	36
3.3.2. Morphological study	39
3.3.3. Thermal analysis	41
3.3.4. Study of antibacterial property	43
3.3.5. Theoretical study	45
3.4. Conclusion	50

Chapter 4: Preparation and characterizations of chitosan/kaolin clay biocomposites

52-72

4.1. Introduction	53
4.2. Synthesis	56
4.2.1. Chitosan film	56

4.2.2. Chitosan/kaolin biocomposite films	56
4.2.3. Crude sample for antibacterial study	58
4.3. Results and discussion	58
4.3.1. Structural evaluation	58
4.3.2. Morphological study	60
4.3.3. Mechanical property	64
4.3.4. Thermal analysis	65
4.3.5. Study of antibacterial property	67
4.3.6. Analysis of swelling test	70
4.4. Conclusion	71

Chapter 5: Preparation and characterizations of chitosan/bentonite and chitosan/silica clay biocomposites and a comparative study with chitosan/kaolin clay biocomposites

73-91

5.1. Introduction	74
5.2. Synthesis	76
5.2.1. Chitosan/clay biocomposite films	76
5.2.2. Crude sample for antibacterial study	77
5.3. Results and Discussion	77
5.3.1. Structural evaluation	77
5.3.2. Morphological study	80
5.3.3. Mechanical property	84
5.3.4. Thermal study	85
5.3.5. Study of antibacterial property	87
5.3.6. Analysis of swelling test	89
5.4. Conclusions	90

Chapter 6: Summary and Conclusions

92-97

References

98-112

Curriculum vitae

Reprint of published papers