PREPARATION AND CHARACTERIZATION OF CHITOSAN-COATED CALCIUM ALGINATE FILM

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ABSTRACT

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The effects of cross-linking with calcium ion and chitosan coating on mechanical properties, swelling behavior and drug release characteristics of alginate films were studied. FTIR spectra of chitosan-coated calcium alginate films showed the characteristic peaks of chitosan indicating that chitosan was successfully coated on calcium alginate film. The chitosan coating on calcium alginate film was also confirmed by ninhydrin staining. Chitosan-coated calcium alginate films showed better tensile strength and Young's modulus than alginate and noncoated calcium alginate films due to the electrostatic interaction at the interface between alginate and chitosan. Both noncoated calcium alginate and chitosan-coated calcium alginate films possessed pH-sensitive swelling characteristics and chitosan-coated calcium alginate films showed higher degrees of swelling than the noncoated films. Drug release studies of the films were carried out at 37 °C at simulated physiological pHs, i.e. pH 2, pH 5.5, and pH 7.2, using salicylic acid and theophylline as model drugs. The amounts of model drugs released from chitosan-coated calcium alginate films were lower than those from the noncoated films and drug release at pH 5.5 gave higher equilibrium drug releasing amounts than at pH 2.0 for both model drugs.

บทคัดย่อ

จีรดา มหัตธน: การเตรียมและการศึกษาคุณสมบัติของแผ่นฟิล์มแคลเซียมแอลจิเนตที่เคลือบผิวด้วยไคโตซาน (Preparation and Characterization of Chitosan-Coated Calcium Alginate Film) อ.ที่ปรึกษา: ผศ.ดร. รัตนา รุจิรวนิช และ ศ. อเลกซานเดอร์ เอ็ม เจมิสัน 95หน้า ISBN 974-17-2320-2

งานวิจัยนี้ศึกษาผลของการเชื่อมโยงให้เกิดโครงร่างตาข่ายด้วยอิออนของแคลเซียมและการเคลือบผิวด้วยไคโตซานต่อคุณสมบัติเชิงกล พฤติกรรมการบวมตัวและลักษณะการปลดปล่อยตัวยาของแผ่นฟิล์มแอลจิเนต ผลการวิเคราะห์สเปกตรัมของรังสีอินฟราเรด (FTIR)และการทดสอบด้วยสารละลายนินไฮดริน พบว่าไคโตซานได้ถูกเคลือบบนแผ่นฟิล์มแคลเซียมแอลจิเนต จากการศึกษาคุณสมบัติเชิงกลพบว่าแผ่นฟิล์มที่ได้จากการเคลือบไคโตซานบนแผ่นฟิล์มแคลเซียมแอลจิเนตมีความทนทานต่อแรงดึงและค่ายังโมดูลัสดีกว่าแผ่นฟิล์มที่ไม่ได้เคลือบไคโตซาน เนื่องจากมีแรงดึงดูดทางไฟฟ้าสถิตเกิดขึ้นระหว่างพื้นผิวของแอลจิเนตและไคโตซาน จากการศึกษาพฤติกรรมการบวมตัวพบว่า แผ่นฟิล์มแคลเซียมแอลจิเนตและฟิล์มที่ได้จากการเคลือบไคโตซานบนแคลเซียมแอลจิเนตมีลักษณะการบวมตัวต่อการเปลี่ยนแปลงของความเป็นกรด-ด่างและแผ่นฟิล์มที่ได้จากการเคลือบไคโตซานบนแผ่นฟิล์มแคลเซียมแอลจิเนตมีค่าการบวมตัวสูงกว่าแผ่นฟิล์มที่ไม่ได้เคลือบไคโตซาน ในการศึกษาการปลดปล่อยตัวยาจากแผ่นฟิล์มทำที่อุณหภูมิ 37 องศาเซลเซียสในสารละลายบัฟเฟอร์ที่มีความเป็นกรด-ด่างเท่ากับ 2 5.5 และ 7.2 ในการศึกษานี้ใช้กรดซาลิไซลิกและทีโอฟีลีนเป็นยาต้นแบบ จากการศึกษาพบว่าการปลดปล่อยตัวยาจากแผ่นฟิล์มที่ได้จากการเคลือบไคโตซานบนแผ่นฟิล์มแคลเซียมแอลจิเนตมีค่าการปลดปล่อยตัวยาน้อยกว่าแผ่นฟิล์มที่ไม่ได้เคลือบ นอกจากนี้เมื่อเปรียบเทียบค่าการปลดปล่อยตัวยาที่ทำในสารละลายบัฟเฟอร์ที่มีความเป็นกรด-ด่างเท่ากับ 5.5 มีค่าการปลดปล่อยตัวยาสูงกว่าในสารละลายบัฟเฟอร์ที่มีความเป็นกรด-ด่างเท่ากับ 2

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TABLE OF CONTENTS

		PAGE
	Title Page	i
	Abstract (in English)	iii
	Abstract (in Thai)	iv
	Acknowledgements	v
	Table of Contents	vi
	List of Tables	ix
	List of Figures	xii
CHAPTER		
I	**INTRODUCTION**	1
II	**LITERATURE REVIEW**	3
	2.1 Alginate Based Material for Drug Delivery Studies	3
	2.2 Chitosan Based Material for Drug Delivery Studies	6
	2.3 Controlled Drug Delivery Systems	10
	2.4 Chitosan-Coated Calcium Alginate Based Material for Drug Delivery Studies	15
III	**EXPERIMENTAL**	17
	3.1 Materials	17
	3.2 Equipment	17
	3.3 Methodology	18
	3.3.1 Preparation of Chitin and Chitosan	18
	3.3.1.1 Preparation of Chitin	18
	3.3.1.2 Preparation of Chitosan	19
	3.3.2 Characterization of Chitosan	19
	3.3.2.1 Degree of Deacetylation	19
	3.3.2.2 Viscosity-Average Molecular Weight	20

CHAPTER **PAGE**

3.3.3 Characterization of Sodium Alginate 21

3.3.4 Preparation of Chitosan-Coated Calcium alginate Films 21

3.3.4.1 Preparation of Alginate Solution 21

3.3.4.2 Preparation of Chitosan Solution 21

3.3.4.3 Preparation of Alginate Films 22

3.3.4.4 Preparation of Model Drug-Loaded Alginate Films 22

3.3.4.5 Preparation of Calcium Alginate Films 22

3.3.4.6 Preparation of Chitosan-Coated Calcium Alginate Films 22

3.3.5 Characterization and Testing of Films 23

3.3.5.1 Fourier Transform Infrared Spectra 23

3.3.5.2 Ninhydrin Staining 23

3.3.5.3 Mechanical Testing 23

3.3.5.4 Swelling Behavior Determination 23

3.3.5.5 Drug Loading Determination 24

3.3.5.6 Drug Release Studies 24

IV RESULTS AND DISCUSSION 25

4.1 Preparation of Chitosan 25

4.2 Characterization of Chitosan 26

4.2.1 Structural Characterization 26

4.2.2 Degree of Deacetylation 27

4.2.3 Viscosity-Average Molecular Weight 27

CHAPTER		PAGE
4.3	Characterization of Alginate	29
4.3.1	Structural Characterization	29
4.3.2	Viscosity-Average Molecular Weight	30
4.4	Characterization and Testing of Films	31
4.4.1	FTIR Spectra Characterization	31
4.4.2	Ninhydrin Staining	32
4.4.3	Mechanical Properties	33
4.4.3.1	Tensile Strength	33
4.4.3.2	Young's Modulus	35
4.4.3.3	Elongation at Break	36
4.4.4	Swelling Study	38
4.4.4.1	Equilibrium Water Content	38
4.4.4.2	Effect of pH	39
4.4.5	Drug Release Studies	42
V	**CONCLUSIONS**	51
	REFERENCES	52
	APPENDICES	55
Appendix A	Determination of molecular weight of chitosan and alginate	55
Appendix B	Mechanical properties of the films	65
Appendix C	UV spectrum of model drugs	71
Appendix D	Calibration curve of model drugs	73
Appendix E	Data of drug release	75
	CURRICULUM VITAE	95

LIST OF TABLES

TABLE		PAGE
2.1	Environmentally sensitive polymers for drug delivery	14
4.1	Yields of chitin produced from shrimp shell	25
4.2	Conversion of chitosan from chitin	25
4.3	FTIR characteristic absorption bands of chitosan	26
4.4	Degrees of deacetylation of chitosan	27
4.5	The viscosity-average molecular weight of chitosan	28
4.6	FTIR characteristic absorption bands of alginate	29
4.7	Degree of swelling and percent weight loss of drug-loaded films	48
A1	Running time of solvent and chitosan solution Treat 1	55
A2	The data of relative viscosity (η_{rel}), specific viscosity (η_{sp}), reduced viscosity (η_{red})	55
A3	Running time of solvent and chitosan solution Treat 2	57
A4	The data of relative viscosity (η_{rel}), specific viscosity 59(η_{sp}), reduced viscosity (η_{red})	57
A5	Running time of solvent and chitosan solution Treat 3	59
A6	The data of relative viscosity (η_{rel}), specific viscosity (η_{sp}), reduced viscosity (η_{red})	59
A7	Running time of solvent and chitosan solution Treat 4	61
A8	The data of relative viscosity (η_{rel}), specific viscosity (η_{sp}), reduced viscosity (η_{red})	61
A9	Running time of solvent and alginate solution	63
A10	The data of relative viscosity (η_{rel}), specific viscosity (η_{sp}), reduced viscosity (η_{red})	63
B1	Tensile strength of the films in dry state	65
B2	Young' s modulus of the films in dry state	66
B3	Elongation at break of the films in dry state	67

TABLE **PAGE**

B4	Tensile strength of the films in wet state	68
B5	Young's modulus of the films in wet state	69
B6	Elongation at break of the films in wet state	70
C1	Summary of maximum wavelength (λ_{max})of each type of model drug	72
D1	The data of calibration curve of salicylic acid solution	73
D2	The data of calibration curve of theophylline solution	74
E1	The release of salicylic acid from calcium alginate film at pH 2.0	75
E2	The release of salicylic acid from calcium alginate film at pH 5.5	77
E3	The release of salicylic acid from calcium alginate film at pH 7.2	79
E4	The release of salicylic acid from chitosan coated calcium alginate film at pH 2	80
E5	The release of salicylic acid from chitosan coated calcium alginate film at pH 5.5	83
E6	The release of salicylic acid from chitosan coated calcium alginate film at pH 7.2	84
E7	The release of theophylline from calcium alginate film at pH 2	85
E8	The release of theophylline from calcium alginate film at pH 5.5	87
E9	The release of theophylline from calcium alginate film at pH 7.2	89
E10	The release of theophylline chitosan coated calcium alginate film at pH 2	90
E11	The release of theophylline chitosan coated calcium alginate film at pH 5.5	92

TABLE **PAGE**

E12 The release of theophylline from chitosan coated calcium alginate film at pH 7.2 94

LIST OF FIGURES

FIGURE		PAGE
2.1	Chemical structure of alginate	4
2.2	The egg-box model for binding of divalent cation to alginates	5
2.3	Chemical structure of chitin	7
2.4	Chemical structure of chitosan	7
2.5	Drug level in the blood from (a) traditional drug administration and (b) controlled delivery dosing	11
2.6	Drug delivery from a typical matrix drug delivery system	12
2.7	Drug delivery from environmentally sensitive release systems	13
2.8	Drug delivery from (a) bulk erosion and (b) surface erosion systems	15
4.1	FTIR spectrum of chitosan	26
4.2	The plot of reduced viscosity and inherent viscosity versus concentration of chitosan solution	28
4.3	FTIR spectrum of alginate	29
4.4	The plot of reduced viscosity and inherent viscosity versus concentration of alginate solution	30
4.5	FTIR spectra of (a) pure alginate film (b) calcium alginate film (c) chitosan-coated calcium alginate film	31
4.6	Ninhydrin test for (a) pure alginate film, (b) calcium alginate film, (c) chitosan-coated calcium alginate film and (d) chitosan film	32
4.7	Tensile strength in the dry state of films	34
4.8	The tensile strength in the wet state of films	34
4.9	Young's Modulus in the dry state of films	35
4.10	Young's Modulus in the wet state of films	36
4.11	Elongation at break of the films in dry state	37

FIGURE **PAGE**

4.12 Elongation at break of the films in wet state 37

4.13 Equilibrium water content of calcium alginate and chitosan-coated calcium alginate films 38

4.14 Swelling behavior of calcium alginate and chitosan-coated calcium alginate films as a function of pH 39

4.15 Swelling behavior of calcium alginate and chitosan-coated calcium alginate films at pH 2 as a function of immersion time 40

4.16 Swelling behavior of calcium alginate and chitosan-coated calcium alginate films at pH 5.5 as a function of immersion time 41

4.17 Swelling behavior of calcium alginate and chitosan-coated calcium alginate films at pH 7.2 as a function of immersion time 41

4.18 Salicylic acid release profile for calcium alginate and chitosan-coated calcium alginate films at pH 2.0 43

4.19 Salicylic acid release profile for calcium alginate and chitosan-coated calcium alginate films at pH 5.5 43

4.20 Salicylic acid release profile for calcium alginate and chitosan-coated calcium alginate films at pH 7.2 44

4.21 Theophylline release profile for calcium alginate and chitosan-coated calcium alginate films at pH 2.0 44

4.22 Theophylline release profile for calcium alginate and chitosan-coated calcium alginate films at pH 5.5 45

4.23 Theophylline release profile for calcium alginate and chitosan-coated calcium alginate films at pH 7.2 45

4.24 Effect of pH on salicylic acid released from calcium alginate and chitosan-coated calcium alginate films 47

4.25 Effect of pH on theophylline released from calcium alginate and chitosan-coated calcium alginate films 47

FIGURE **PAGE**

4.26 Comparison of the amounts of model drugs released from calcium alginate and chitosan-coated calcium alginate films at pH 2.0 49

4.27 Comparison of the amounts of model drugs released from calcium alginate and chitosan-coated calcium alginate films at pH 5.5 50

4.28 Chemical structure of salicylic acid 50

4.29 Chemical structure of anhydrous theophylline 50

A1 The plot of reduced viscosity (η_{sp}/c) and ln ((η_{rel}) /c) versus concentration of chitosan solution: • = (η_{sp}/c) and = ln ((η_{rel}) /c) 56

A2 The plot of reduced viscosity (η_{sp}/c) and ln ((η_{rel}) /c) versus concentration of chitosan solution: • = (η_{sp}/c) and = ln ((η_{rel}) /c) 58

A3 The plot of reduced viscosity (η_{sp}/c) and ln ((η_{rel}) /c) versus concentration of chitosan solution: • = (η_{sp}/c) and = ln ((η_{rel}) /c) 60

A4 The plot of reduced viscosity (η_{sp}/c) and ln ((η_{rel}) /c) versus concentration of chitosan solution: • = (η_{sp}/c) and = ln ((η_{rel}) /c) 62

A5 The plot of reduced viscosity (η_{sp}/c) and ln ((η_{rel}) /c) versus concentration of chitosan solution: • = (η_{sp}/c) and = ln ((η_{rel}) /c) 64

C1 UV spectrum of theophylline 71

C2 UV spectrum of salicylic acid 71

D1 Calibration curve of salicylic acid solution 73

D2 Calibration curve of theophylline solution 74