

การเตรียมและการดูดซับ โพรตีนของฟิล์มบางพอลิไอออนเชิงซ้อนของไคโตซานและอนุพันธ์ไคโตซาน



นางสาว สมฤทัย ชรรณยานนท์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต

สาขาวิชาปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์

คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ปีการศึกษา 2548

ISBN: 974-17-5172-9

ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

PREPARATION AND PROTEIN ADSORPTION OF POLYION COMPLEX
THIN FILM OF CHITOSAN AND CHITOSAN DERIVATIVES


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A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science Program in Petrochemistry and Polymer Science
Faculty of Science
Chulalongkorn University
Academic Year 2005
ISBN: 974-17-5172-9


481768

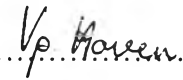
Thesis Title Preparation and Protein Adsorption of Polyion Complex Thin Film of Chitosan and Chitosan Derivatives
By Miss Somruethai Channasanon
Field of Study Petrochemistry and Polymer Science
Thesis Advisor Assistant Professor Vipavee P. Hoven, Ph.D.
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Accepted by the Faculty of Science, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree



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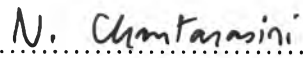
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สมฤทัย ชรรณยานนท์ : การเตรียมและการดูดซับโปรตีนของฟิล์มบางพอลิไอออนเชิงซ้อนของไคโตซานและอนุพันธ์ไคโตซาน (PREPARATION AND PROTEIN ADSORPTION OF POLYION COMPLEX THIN FILM OF CHITOSAN AND CHITOSAN DERIVATIVES)
 อ. ที่ปรึกษา : ผศ.ดร. วิภาวี โฮვნัน, อ.ที่ปรึกษาร่วม : ศ.ดร. สุดา เกียรติกำจรวงศ์, 58 หน้า. ISBN 974-17-5172-9.

อนุพันธ์ที่มีประจุของไคโตซาน, เอ็น-ซัลโฟเฟออร์ฟูริลไคโตซาน (เอสเอฟซี) และ เอ็น-[(สอง-ไฮดรอกซิล-สาม-ไฮดรอกซี-ไอโซพรูปิพโร-1-โพรพิล)ไคโตซาน คลอไรด์ (เอชทีเอซีซี), ถูกเตรียมขึ้นโดยปฏิกิริยารีดักทีฟอัลคิลเลชันโดยใช้เกลือโซเดียมของ 5-ฟอร์มิล-2-ฟิวเร็นซัลโฟนิคแอซิด เป็นรีเอเจนต์ และปฏิกิริยาเปิดวงของไกลซิดิลไฮดรอกซิลไอโซพรูปิพโร-1-โพรพิลไคโตซาน (จีทีเอ็มเอซี) ด้วยหมู่เอมิโนของไคโตซานตามลำดับ วิเคราะห์โครงสร้างทางเคมีของอนุพันธ์ที่มีประจุของไคโตซานได้ด้วยโปรตอนเอ็นเอ็มอาร์และเอฟทีไออาร์ ฟิล์มมัลติเลเยอร์ของไคโตซานและอนุพันธ์ที่มีประจุของไคโตซานเตรียมได้โดยวิธีการดูดซับแบบประกอบชั้นต่อชั้นบนพื้นผิวสัปสเตรทพอลิเอทิลีนเททาเลดที่ผ่านการทรีตด้วยพลาสมา (ทรีต-พีอีที) ได้ ได้ติดตามกระบวนการประกอบฟิล์มด้วย ควอทซ์คริสตัลไมโครบาลานซ์ (ควีซีเอ็ม) ผลจากการวัดมุมสัมผัสของน้ำแสดงให้เห็นว่าฟิล์มมัลติเลเยอร์มีลักษณะเป็นชั้น และทำการทดสอบฤทธิ์ทางชีวภาพของฟิล์มมัลติเลเยอร์ที่ติดบนพื้นผิวสัปสเตรททรีต-พีอีทีที่มีต่อโปรตีนที่มีขนาดและประจุต่างๆกัน ผลจากงานวิจัยนี้แสดงให้เห็นว่าทั้งเอสเอฟซีและเอชทีเอซีซีเป็นตัวเลือกที่มีศักยภาพในการนำไปประยุกต์ทางการแพทย์ได้

สาขาวิชา.....ปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์

ปีการศึกษา..... 2548

ลายมือชื่อนิสิต

ลายมือชื่ออาจารย์ที่ปรึกษา

ลายมือชื่ออาจารย์ที่ปรึกษาร่วม

4573415423 : MAJOR PETROCHEMISTRY AND POLYMER SCIENCE

KEY WORD: CHITOSAN / CHARGED DERIVATIVE / LAYER-BY-LAYER ADSORPTION / MULTILAYER FILM / POLYELECTROLYTE / PROTEIN ADSORPTION

SOMRUETHAI CHANNASANON : PREPARATION AND PROTEIN ADSORPTION OF POLYION COMPLEX THIN FILM OF CHITOSAN AND CHITOSAN DERIVATIVES. THESIS ADVISOR : ASST. PROF. VIPAVEE P. HOVEN, Ph.D, THESIS CO-ADVISOR : PROF. SUDA KIATKAMJORNWONG, Ph.D, 58 pp. ISBN 974-17-5172-9.

Charged derivatives of chitosan, *N*-sulfofurfuryl chitosan (SFC) and *N*-[(2-hydroxyl-3-trimethylammonium)propyl]chitosan chloride (HTACC), were prepared by reductive alkylation using 5-formyl-2-furansulfonic acid, sodium salt (FFSA) as a reagent and ring opening of glycidyltrimethylammonium chloride (GTMAC) by amino groups of chitosan, respectively. Chemical structures of the charged derivatives were verified by ¹H NMR and FTIR analyses. Multilayer thin film of chitosan and its charged derivatives was fabricated by alternate layer-by-layer adsorption on plasma-treated poly(ethylene terephthalate) (treated PET) substrate. Assembly process was monitored by quartz crystal microbalance (QCM). Stratification of multilayer film was demonstrated by water contact angle data. Bioactivity of deposited multilayer film on treated PET substrate was tested against selected proteins having distinctive size and charge. This research promptly suggests that both SFC and HTACC are potential candidates for biomedical application.

Field of study Petrochemistry and Polymer Science Student's signature *Somruethai Ch.*
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ACKNOWLEDGEMENTS

This research has been finished due to endless efforts of my thesis advisor, Assistant Professor Dr. Vipavee P. Hoven who always provides me the suggestion and encouragement throughout the course of this work. I would also like to acknowledge Prof. Dr. Suda Kiatkamjornwong, my thesis co-advisor, for her invaluable comments and suggestions on research.

I would like to express my sincere gratitude to Associate Professor Dr. Supawan Tantayanon; Assistant Professor Dr. Warinthorn Chavasiri and Associate Professor Dr. Nuanphun Chantarasiri for their invaluable suggestions as committee members.

Special thanks go to Sensor Research Group for ATR-FTIR facility, Dr. Katanchalee Mai-ngam from National Metals and Materials Technology Center (MTEC) for providing contact angle goniometer and microplate reader and National Center for Genetic Engineering and Biotechnology (BIOTEC) for nanopure distilled water. I gratefully acknowledge a research funding for graduate students from Research Team Promotion Grant, Thailand Research Fund (Principal Investigator: Prof. Dr. Suda Kiatkamjornwong) for financial support. I appreciate suggestions, comments and encouragement from all members of Organic Synthesis Research Unit.

Finally, I would like to affectionately give all gratitude to my family and friends for patient support throughout my entire study.

CONTENTS

	Page
ABSTRACT IN THAI.....	iv
ABSTRACT IN ENGLISH.....	v
ACKNOWLEDGEMENTS.....	vi
CONTENTS.....	vii
LIST OF FIGURES.....	x
LIST OF TABLES.....	xii
LIST OF SCHEMES.....	xiii
LIST OF ABBREVIATIONS	xiv
CHAPTER I : INTRODUCTION.....	1
1.1 Statement of Problem.....	1
1.2 Objectives.....	2
1.3 Scope of Investigation.....	3
CHAPTER II : THEORY AND LITERATURE REVIEW.....	4
2.1 Chitosan.....	4
2.2 Charged Derivatives of Chitosan.....	5
2.3 Polymer Adsorption.....	10
2.4 Layer-by-Layer Adsorption.....	11
2.5 Protein Adsorption on Chitosan Surface.....	15
2.6 Surface Characterization	16
2.6.1 Quartz Crystal Microbalance (QCM).....	16
2.6.2 Contact Angle Measurement.....	18
2.6.3 Attenuated Total Reflectance-Infrared Spectroscopy (ATR-IR).....	19

	Page
CHAPTER III : EXPERIMENTAL.....	21
3.1 Materials.....	21
3.2 Equipments.....	22
3.2.1 Nuclear Magnetic Resonance Spectroscopy (NMR).....	22
3.2.2 Fourier Transform-Infrared Spectroscopy (FT-IR).....	22
3.2.3 Attenuated Total Reflectance-Infrared Spectroscopy (ATR-IR).....	23
3.2.4 Quartz Crystal Microbalance (QCM).	23
3.2.5 Contact Angle Measurements.....	23
3.2.6 Microplate Reader.....	23
3.3 Synthesis of Charged Derivatives of Chitosan	24
3.3.1 <i>N</i> -Sulfofurfuryl Chitosan (SFC).....	24
3.3.2 <i>N</i> -[(2-Hydroxyl-3-trimethylammonium)propyl]chitosan chloride (HTACC).....	24
3.4 Pretreatment of Plasma-treated Poly(ethylene terephthalate) (PET) Substrate	25
3.5 Polyelectrolyte Self-assembly.....	25
3.6 Protocol for Protein Adsorption Test.....	25
CHAPTER IV : RESULTS AND DISCUSSION.....	27
4.1 Synthesis of Charged Derivatives of Chitosan	27
4.1.1 Synthesis of <i>N</i> -sulfofurfuryl Chitosan (SFC).....	27
4.1.2 Synthesis of <i>N</i> -[(2-hydroxyl-3- trimethylammonium)propyl]chitosan chloride (HTACC)	30
4.1.3 Solubility of SFC and HTACC.....	32
4.1.4 Adsorption of Charged Derivatives of Chitosan.....	33
4.1.4.1 Effect of Adsorption Time and Concentration	33
4.1.4.2 Effect of Ionic Strength.....	35

	Page
4.2 Alternative Layer-by-layer Adsorption.....	36
4.2.1 Confirmation of Multilayer Formation.....	36
4.2.2 Multilayer Assembly.....	38
4.2.3 Stratification of Multilayer Film.....	39
4.3 Protein Adsorption.....	41
CHAPTER V : CONCLUSIONS AND SUGGESTION.....	46
REFERENCES.....	48
APPENDICES.....	52
APPENDIX A.....	53
APPENDIX B.....	55
VITAE.....	58

LIST OF FIGURES

Figure	Page
2.1 Pictorial representation of an adsorbed polymer layer, indicating loops, tails and trains (L : thickness of chain).....	10
2.2 Alternate layer-by-layer adsorption of polyanion and polycation onto a positively charged substrate.....	12
2.3 Diagram of quartz crystal microbalance (QCM).....	17
2.4 Equilibrium of the three-phase boundary on solid surface.....	18
2.5 Diagram of ATR-IR.....	19
4.1 ¹ H NMR spectra of SFC obtained using the mole ratio between FFSA and NH ₂ of chitosan of a) 0.7, b) 1, c) 2, and d) 4 (solvent: D ₂ O, 25 °C).....	28
4.2 FT-IR spectra of FFSA, chitosan and SFC.....	29
4.3 ¹ H NMR spectra of HTACC obtained using the mole ratio between GTMAC and NH ₂ of chitosan of a) 2, b) 4, and c) 6 (solvent: D ₂ O, 25 °C).....	30
4.4 FT-IR spectra of chitosan and HTACC.....	32
4.5 <i>In situ</i> monitoring of frequency shift (Hz) as a function of time of SFC without NaCl at pH 8 having different concentration: (a) 3 mg/mL, (b) 2 mg/mL, and (c) 1 mg/mL	34
4.6 Adsorption isotherms of SFC and HTACC determined by conventional mode of QCM.....	35
4.7 Frequency change obtained from QCM analysis as a function of a number of layer.....	37
4.8 Chemical structures of PET (left) and plasma-treated PET (right).....	38
4.9 Polycations and polyanions used for multilayer assembly.....	39
4.10 Water contact angles of the multilayer thin film.....	40
4.11 ATR-IR spectra of treated PET and multilayer films: (a) treated PET-(HTACC-PAA) ₁₃ , (b) treated PET-(HTACC-PAA) ₁₂ -HTACC, (c) treated PET-(chitosan-PSS) ₁₃ , (d) treated PET-(chitosan-PSS) ₁₂ -chitosan, and (e) treated PET.....	41

4.12	The amount of BSA adsorption per surface area ($\mu\text{g}/\text{cm}^2$) of treated PET, (chitosan-PSS) _n , (PAH-SFC) _n , and (HTACC-PAA) _n assemblies on treated PET substrates in the presence of 1M NaCl.....	43
4.13	The amount of FIB adsorption per surface area ($\mu\text{g}/\text{cm}^2$) of treated PET, (chitosan-PSS) _n , (PAH-SFC) _n , and (HTACC-PAA) _n assemblies on treated PET substrates in the presence of 1M NaCl.....	44
4.14	The amount of GLB adsorption per surface area ($\mu\text{g}/\text{cm}^2$) of treated PET, (chitosan-PSS) _n , (PAH-SFC) _n , and (HTACC-PAA) _n assemblies on treated PET substrates in the presence of 1M NaCl.....	45
4.15	The amount of LYZ adsorption per surface area ($\mu\text{g}/\text{cm}^2$) of treated PET, (chitosan-PSS) _n , (PAH-SFC) _n , and (HTACC-PAA) _n assemblies on treated PET substrates in the presence of 1M NaCl.....	45
B-1	Formation of purple complex between BCA and cuprous ion generated from the biuret reaction.....	56
B-2	A calibration curve of the amount of albumin adsorbed and the absorbance obtained from BCA microassay.....	57

LIST OF TABLES

Table	Page
4.1 Degree of substitution (%DS) of sulfonate group on chitosan after reacting with FFSA in acetic acid/MeOH (1:1, v/v) for 18 h as determined by ¹ H-NMR.....	29
4.2 Degree of substitution (%DS) of quaternary ammonium group on chitosan after reacting with GTMAC at 70 °C in acetic acid for 24 h as determined by ¹ H-NMR.....	31
4.3 Frequency shift (Hz) and adsorption time at equilibrium (min) of SFC and HTACC obtained from <i>in-situ</i> monitoring by QCM.....	34
4.4 Frequency shift (Hz) after adsorption of SFC and HTACC measured by conventional mode of QCM.....	36
4.5 Physical properties of proteins used in this investigation.....	42
A-1 Frequency shift, ΔF (Hz) of QCM of three pairs of multilayer film in the presence of 1M NaCl.....	53
A-2 Water contact angle of treated PET-(chitosan-PSS) _n assemblies, 1.0 M NaCl was added to both polyelectrolyte solutions.....	53
A-3 Water contact angle of treated PET-(PAH-SFC) _n assemblies, 1.0 M NaCl was added to both polyelectrolyte solutions	54
A-4 Water contact angle of treated PET-(HTACC-PAA) _n assemblies, 1.0 M NaCl was added to both polyelectrolyte solutions	54
B-1 Standard BSA solution, for the calibration curve	56

LIST OF SCHEMES

Scheme	Page
2.1 Structures of chitin and chitosan.....	4
2.2 Synthesis of sulfonate derivatives of chitosan.....	6
2.3 Synthesis of <i>N</i> -sulfofurfuryl chitosan.....	7
2.4 Synthesis of quaternary ammonium chitosan (QAC).....	8
2.5 Synthesis of quaternary ammonium salt of <i>N</i> -alkyl chitosan.....	8
2.6 Synthesis of <i>N</i> -[(2-hydroxyl-3-trimethylammonium)propyl]chitosan chloride (HTACC).....	9
2.7 Synthesis of the HTCC and NMA-HTCC.....	10

LIST OF ABBREVIATIONS

ATR-IR	: Attenuated Total Reflectance Infrared Spectroscopy
BCA	: Bicinchoninic acid
BSA	: Bovine serum albumin
FIB	: Fibrinogen
FFSA	: 5-Formyl-2-furansulfonic acid, sodium salt
FT-IR	: Fourier Transform Infrared Spectroscopy
GLB	: Gamma-globulin
GTMAC	: Glycidyltrimethylammonium chloride
HCl	: Hydrochloric acid
HTACC	: <i>N</i> -[(2-hydroxyl-3-trimethylammonium)propyl]chitosan chloride
LYZ	: Lysozyme
NMR	: Nuclear Magnetic Resonance Spectroscopy
%DS	: Percent degree of substitution
PBS	: Phosphate buffer saline
PAA	: Polyacrylic acid, sodium salt
PAH	: Poly(allylamine hydrochloride)
PET	: Poly(ethylene terephthalate)
PSS	: Poly(sodium styrene sulfonate)
QCM	: Quartz Crystal Microbalance

NaBH ₄	: Sodium borohydride
SDS	: Sodium dodecyl sulfate
NaOH	: Sodium hydroxide
SFC	: <i>N</i> -sulfofurfuryl chitosan