

**CHARACTERIZATION OF POLYSTYRENE PRODUCED BY
ADMICELLAR POLYMERIZATION**



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ABSTRACT

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Admicellar polymerization is a process involving the polymerization of adsolubilized monomer within adsorbed surfactant aggregates on a substrate surface. This research focused on the effects of surfactant loading, monomer loading, and reaction time on the characteristics of the polymer formed by admicellar polymerization. The polymerization reactions were carried out on nonporous silica (Aerosil[®]OX50) in cetyltrimethylammonium bromide (CTAB) aggregates using styrene monomer. The polystyrene was extracted from the surface of the modified silica using tetrahydrofuran (THF) solvent. CTAB adsorption and styrene adsolubilization at two different adsorbed surfactant concentrations (20 and 100 μ mol/g) on the nonporous silica were studied. The modified silica has been examined by TGA and AFM. The extracted polystyrene was characterized by FTIR, TGA, and GPC. The results showed that the reaction time for conducting admicellar polymerization should not be shorter than two hours to obtain relatively high molecular weight polystyrene. The extent of the polystyrene film and amount of polystyrene forming on silica particles increased with increasing CTAB adsorption and adsolubilized styrene.

บทคัดย่อ

สุชาดา อารยวงษ์กุล : การวิเคราะห์คุณสมบัติของพอลิสไตรีน ที่ได้จากวิธีแอดไมเซลลาร์ พอลิเมอไรเซชัน (Characterization of Polystyrene Produced by Admicellar Polymerization) อ. ที่ปรึกษา : ดร. มานิตย์ นิธิธนากุล, ดร. บุญยรัชต์ กิตยานันท์ และ ผศ. ดร. จอห์น เซฮ์ โอ เฮเวอร์, 99 หน้า ISBN 974-03-1597-6

แอดไมเซลลาร์ พอลิเมอไรเซชันคือวิธีสังเคราะห์พอลิเมอร์จากมอนอเมอร์ ที่เกิดภายในกลุ่มของสารลดแรงตึงผิวที่จับตัวบนพื้นผิวของซัพสเตรท งานวิจัยนี้มุ่งศึกษาผลกระทบของจำนวนสารลดแรงตึงผิว, จำนวนโมโนเมอร์ และ เวลาการทำปฏิกิริยาต่อคุณสมบัติของพอลิเมอร์ที่เกิดจากวิธีการ แอดไมเซลลาร์ พอลิเมอไรเซชัน ปฏิกิริยาเกิดบนซิลิกาที่ไม่มีรูพรุน (Aerosil® OX50) ในกลุ่มของสารลดแรงตึงผิวเซติลไตรเมทิลแอมโมเนียมโบรไมด์ โดยใช้สไตรีนเป็นโมโนเมอร์ พอลิสไตรีนถูกสกัดออกมาจากซิลิกาที่ผ่านกระบวนการแอดไมเซลลาร์พอลิเมอไรเซชันแล้ว โดยตัวทำละลายเททระไฮโดรฟูแลน งานวิจัยนี้ยังศึกษาถึงการยึดเกาะของเซติลไตรเมทิลแอมโมเนียมโบรไมด์ และการละลายในชั้นไมเซลที่ยึดเกาะของสไตรีนที่ความเข้มข้นของสารลดแรงตึงผิวที่ (20 และ 100 ไมโครโมลต่อกรัม) บนซิลิกาที่ไม่มีรูพรุน ในการวิเคราะห์ซิลิกาที่ได้ผ่านการปรับปรุงแล้วถูกตรวจสอบด้วย FTIR และ AFM พอลิสไตรีนที่สกัดออกมาถูกตรวจสอบคุณสมบัติด้วย FTIR, TGA และ GPC ผลจากการวิจัยสรุปว่าเวลาการเกิดปฏิกิริยาไม่ควรต่ำกว่าสองชั่วโมงเพื่อให้เกิดพอลิเมอร์ที่มีน้ำหนักโมเลกุลค่อนข้างสูง เมื่อการยึดเกาะของเซติลไตรเมทิลแอมโมเนียมโบรไมด์เพิ่มขึ้นและการละลายในชั้นไมเซลที่ยึดเกาะของสไตรีนเพิ่มขึ้นพบว่าฟิล์มของพอลิสไตรีนบนผิวของซิลิกามีลักษณะแผ่ขยายมากขึ้นและจำนวนพอลิสไตรีนบนผิวซิลิกามากขึ้นตามลำดับ

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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	x
CHAPTER	
I	
INTRODUCTION	1
1.1 Surfactant Adsorption	2
1.2 Adsolubilization	4
1.3 Admicellar Polymerization	5
II	
LITERATURE SURVEY	7
2.1 Adsorption Isotherm	7
2.2 Adsolubilization Isotherm	8
2.3 Admicellar Polymerization	8
III	
EXPERIMENTAL	11
3.1 Materials	11
3.2 Equipment	11
3.3 Methodology	12
3.3.1 Adsorption Measurement	12
3.3.2 Adsolubilization Measurement	13
3.3.3 Admicellar Polymerization	14

CHAPTER	PAGE
3.3.4 Polymer Extraction	15
3.3.5 Characterization	15
3.3.5.1 Fourier transform infrared spectroscopy	15
3.3.5.2 Thermogravimetric analysis	15
3.3.5.3 Gel permeation chromatography	15
3.3.5.4 Atomic force microscope	16
IV RESULTS AND DISCUSSION	17
4.1 Adsorption Isotherm of CTAB on Aerosil [®] OX50	17
4.2 Styrene Adsolubilization Measurement	18
4.3 Characterization of Modified Silica, Extracted Polystyrene, and Extracted Silica	19
4.3.1 Fourier Transform Infrared Result	19
4.3.2 Thermogravimetric Analysis Result	22
4.3.3 Gel Permeation Chromatography Result	27
4.3.3.1 Effect of reaction time	30
4.3.3.2 Effect of styrene loading	32
4.3.4 Scanning Electron Micrographs of Unmodified Silica and Modified Silica	34
4.3.5 Atomic Force Micrograph of Modified Silica and Extracted Silica	37
V CONCLUSIONS	42
REFERENCES	43
APPENDICES	45
Appendix A CTAB adsorption measurement	45
Appendix B Styrene adsolubilization measurement	47

CHAPTER	PAGE
Appendix C Calculation amount of CTAB loading, styrene loading, and AIBN for admicellar polymerization	49
Appendix D Data of gel permeation chromatography	51
CURRICULUM VITAE	98

LIST OF TABLES

TABLE	PAGE
3.1 Admicellar polymerization condition	14
4.1 % weight of polystyrene produced in adsorbed CTAB 20 $\mu\text{mol/g}$ on nonporous silica with vary monomer loading and reaction time	26
4.2 \overline{M}_w , \overline{M}_n , and MWD of extracted materials produced in CTAB 20 $\mu\text{mol/g}$	28
4.3 \overline{M}_w , \overline{M}_n , and MWD of extracted materials produced in CTAB 100 $\mu\text{mol/g}$	29
A1 Data from CTAB adsorption isotherm on Aerosil [®] OX50	45
B1 Data from styrene adsolubilization into CTAB adsorption 20 $\mu\text{mol/g}$ silica on Aerosil [®] OX50	47
B2 Data from styrene adsolubilization into CTAB adsorption 100 $\mu\text{mol/g}$ silica on Aerosil [®] OX50	48
C1 Calculation of initial CTAB concentration for CTAB adsorption 20 and 100 $\mu\text{mol/g}$ silica in the system	49
C2 Calculation of initial styrene loading into CTAB adsorption 20 $\mu\text{mol/g}$ silica in the system	49
C3 Calculation of initial styrene loading into CTAB adsorption 100 $\mu\text{mol/g}$ of silica in the system	50
C4 Calculation of AIBN loading at CTAB adsorption 20 $\mu\text{mol/g}$ of silica	50
C5 Calculation of AIBN loading at CTAB adsorption 100 $\mu\text{mol/g}$ silica	50
D1 Sample name for gel permeation analysis	51

LIST OF FIGURES

FIGURE	PAGE
1.1 S-shaped adsorption isotherms for an ionic surfactant on an oppositely charged substrate	4
1.2 Phenomena of solubilization and adsolubilization	4
1.3 Ultra-thin film forming process	6
4.1 CTAB adsorption isotherms on Aerosil®OX50	17
4.2 Adsolubilization isotherm of styrene at two CTAB adsorption concentrations (20 $\mu\text{mol/g}$ and 100 $\mu\text{mol/g}$)	18
4.3 FTIR spectra of polystyrene standard, CTAB, modified silica, and pure silica	20
4.4 FTIR spectra of polystyrene standard and extracted material	21
4.5 Thermogram of extracted polystyrene	23
4.6 Thermogram of CTAB	24
4.7 Thermogram of adsorbed CTAB on silica (100 $\mu\text{mol/g}$)	24
4.8 Thermogram of modified silica	25
4.9 Thermogram of modified silica after extraction	25
4.10 Effect of reaction time on weight average molecular weight of polystyrene formed in CTAB concentration 20 $\mu\text{mol/g}$	31
4.11 Effect of reaction time on weight average molecular weight of polystyrene formed in CTAB concentration 100 $\mu\text{mol/g}$	31
4.12 Effect of styrene loading on weight average molecular weight of polystyrene formed in CTAB concentration 20 $\mu\text{mol/g}$	33
4.13 Effect of styrene loading on weight average molecular weight of polystyrene formed in CTAB concentration 100 $\mu\text{mol/g}$	33
4.14 Micrographs of unmodified silica, Aerosil OX50	34
4.15 Micrographs of modified silica with adsorbed CTAB 100 $\mu\text{mol/g}$: adsolubilized styrene 100 $\mu\text{mol/g}$ at 30 minutes	35

FIGURE	PAGE
4.16 Micrographs of modified silica with adsorbed CTAB 100 $\mu\text{mol/g}$: adsolubilized styrene 100 $\mu\text{mol/g}$ at 1 hour	35
4.17 Micrographs of modified silica with adsorbed CTAB 100 $\mu\text{mol/g}$: adsolubilized styrene 100 $\mu\text{mol/g}$ at 2 hours	35
4.18 Micrographs of modified silica with adsorbed CTAB 100 $\mu\text{mol/g}$: adsolubilized styrene 100 $\mu\text{mol/g}$ at 4 hours	36
4.19 Micrographs of modified silica with adsorbed CTAB 100 $\mu\text{mol/g}$: adsolubilized styrene 100 $\mu\text{mol/g}$ at 24 hours	36
4.20 Atomic force micrograph of modified silica prepared in CTAB 20 $\mu\text{mol/g}$: adsolubilized styrene 10 $\mu\text{mol/g}$ (1:0.5) at 6 hours reaction time	39
4.21 Atomic force micrograph of modified silica prepared in adsorbed CTAB 20 $\mu\text{mol/g}$: adsolubilized styrene 40 $\mu\text{mol/g}$ (1:2) at 6 hours reaction time	39
4.22 Atomic force micrograph of modified silica in prepared in CTAB 100 $\mu\text{mol/g}$: adsolubilized styrene 50 $\mu\text{mol/g}$ (1:0.5) at 6 hours reaction time	40
4.23 Atomic force micrograph of modified silica prepared in CTAB 100 $\mu\text{mol/g}$: styrene 200 $\mu\text{mol/g}$ (1:2) at 6 hours reaction time	40
4.24 Comparison of atomic force micrograph of modified silica before and after extraction	41