

**CHARACTERIZATION OF POLYSTYRENE FORMED  
VIA ADMICELLAR POLYMERIZATION:  
THE EFFECT OF NONIONIC SURFACTANT**

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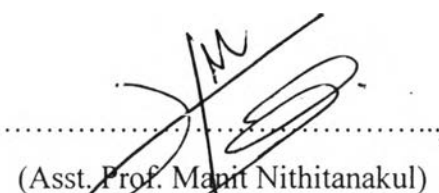
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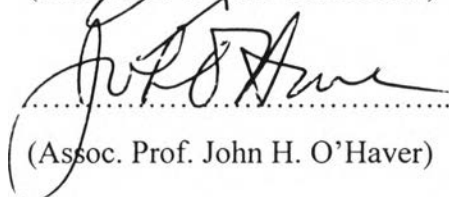
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## ABSTRACT

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Admicellar polymerization, or the polymerization of monomers solubilized inside adsorbed surfactant aggregates, is a technique used for synthesizing polymer films on solid substrates. This study looked at the distribution and characteristics of polystyrene film formed via admicellar polymerization using non-ionic surfactant. The investigated system included polyethoxylated octyl phenol (Triton X-100) as a non-ionic surfactant and nonporous silica (Aerosil OX<sup>®</sup>50) as substrates. The thin polystyrene films are extracted from the surface of the modified silica using tetrahydrofuran (THF) solvent. The adsorption isotherm, adsolubilization isotherm and polymerization at two levels of adsorption (Triton X-100 50 and 100  $\mu\text{mol/g}$  of silica) were studied. The formation of polystyrene film formed at these two levels of adsorption were confirmed by FTIR, GPC, TGA, and AFM. The results showed that polystyrene film of reasonable molecular weight can be obtained only at high Triton X-100 concentration (100  $\mu\text{mol/g}$  of silica). The molecular weight and extent of polymer film coverage increased with increasing styrene loading. The average thickness of the polystyrene is approximately 3-7 nm.

## บทคัดย่อ

สิรินันท์ มหาเจษฎา : การศึกษาคุณสมบัติของพอลิสไตรีนฟิล์ม ที่สังเคราะห์จากวิธี แอดไมเซลล์ลาร์ พอลิเมอไรเซชัน โดยใช้สารลดแรงตึงผิวชนิดไม่มีประจุ (Characterization of Polystyrene formed via Admicellar Polymerization: The Effect of Non-Ionic Surfactant) อ. ที่ปรึกษา ผศ. ดร. มานิตย์ นิธิธนากุล และ รศ. ดร. จอห์น เฮช โอ เฮเวอร์, 66 หน้า ISBN 974-9937-23-6

แอดไมเซลล์ลาร์ พอลิเมอไรเซชัน คือวิธีการสังเคราะห์ พอลิเมอร์ฟิล์มบนพื้นผิวของซัพเสรท เกิดจากปฏิกิริยาพอลิเมอไรเซชันของมอนอเมอร์ที่ละลายอยู่ในกลุ่มของสารลดแรงตึงผิว งานวิจัยนี้มุ่งศึกษาคุณลักษณะของพอลิเมอร์ฟิล์ม ที่เกิดจากการละลายของสไตรีนมอนอเมอร์ในกลุ่มสารลดแรงตึงผิวชนิดไม่มีประจุประเภทพอลิเอทอกซีเลทเตด ออกทิล ฟีนอล (Triton X-100) บนซิลิกาชนิดไม่มีรูพรุน (Aerosil OX<sup>®</sup>50) พอลิสไตรีนฟิล์มที่ได้สกัดออกด้วยตัวทำละลายเทระไฮโครฟูแลน งานวิจัยยังศึกษาถึงการยึดเกาะของพอลิเอทอกซีเลทเตด ออกทิล ฟีนอล บนซิลิกาซัพเสรท และการละลายของสไตรีนในกลุ่มของสารลดแรงตึงผิวนี้ที่ระดับความเข้มข้น 50 และ 100 ไมโครโมลต่อกรัม พอลิสไตรีนที่เกิดขึ้นนำมาวิเคราะห์คุณสมบัติด้วย FTIR GPC TGA และ AFM ผลจากการวิจัยสรุปว่า พอลิสไตรีนฟิล์มที่ระดับความเข้มข้นของกลุ่มสารลดแรงตึงผิวนี้เท่ากับ 100 ไมโครโมลต่อกรัมของซิลิกา จะให้พอลิสไตรีนฟิล์มที่มีน้ำหนักโมเลกุลค่อนข้างสูง นอกจากนี้ยังพบว่าที่ระดับการยึดเกาะของพอลิเอทอกซีเลทเตด ออกทิล ฟีนอล และระดับการละลายของสไตรีนมอนอเมอร์ที่เพิ่มขึ้น ทำให้พอลิสไตรีนมีน้ำหนักโมเลกุลเพิ่มขึ้นและฟิล์มมีลักษณะแผ่ขยายมากขึ้นอีกด้วย โดยระดับความหนาเฉลี่ยของพอลิสไตรีนฟิล์มที่ได้อยู่ในช่วง 3-7 นาโนเมตร

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## TABLE OF CONTENTS

	<b>PAGE</b>
Title Page	i
Abstract (in English)	iii
Abstract (in Thai)	iv
Acknowledgements	v
Table of Contents	vi
List of Tables	viii
List of Figures	ix
 <b>CHAPTER</b>	
<b>I INTRODUCTION</b>	<b>1</b>
 <b>II BACKGROUND AND LITERATURE SURVEY</b>	 <b>3</b>
2.1 Silica	3
2.2 Non-ionic Surfactant	4
2.3. Surfactant Adsorption on Hydrophilic Surface	5
2.4 Adsolubilization	9
2.5 Admicellar Polymerization	10
2.6 Literature survey	12
2.6.1 Surfactant Adsorption	12
2.6.2 Adsolubilization Isotherm	15
2.6.3 Admicellar Polymerization	16
 <b>III EXPERIMENTAL</b>	 <b>18</b>
3.1 Materials	18
3.2 Equipment	18
3.3 Adsorption Measurement	19
3.4 Adsolubilization Measurement	19
3.5 Admicellar Polymerization	20



## LIST OF TABLES

TABLE		PAGE
4.1	$\overline{M}_w$ , $\overline{M}_n$ , and MWD of extracted materials produced in Triton X-100 50 $\mu\text{mol/g}$	29
4.2	$\overline{M}_w$ , $\overline{M}_n$ , and MWD of extracted materials produced in Triton X-100 100 $\mu\text{mol/g}$	29



## LIST OF FIGURES

FIGURE	PAGE	
2.1	The silanol to silanol reaction by hydrogen bonding	3
2.2	Schematic illustration of a surfactant	4
2.3	Structure of Triton X-100, an ethoxylated octylphenol non-ionic surfactant (n=9-10)	5
2.4	Schematic illustration of the adsorption of non-ionic surfactants on a silica surface	6
2.5	Schematic representations of the adsorption of an ionic surfactant on a charged surface as a function of surfactant concentration	7
2.6	Adsorption of various poly(ethylene glycol)monoalkyl ethers, $C_mE_n$ on silica at 25°C showing an increase adsorption	7
2.7	Adsorption of two non-ionic surfactants on silica as a function of pH	8
2.8	Schematic of solubilization and adsolubilization	9
2.9	Admicellar polymerization process for the formation of an ultra-thin polymer film	11
2.10	Adsorption scheme form on silica. Initially a small amount of adsorption takes placed due to hydrogen bonding	14
2.11	Adsorption isotherm of Triton X surfactants with different-number of EO units on silica	14
4.1	Adsorption isotherms of Triton X-100 surfactant on silica	23
4.2	Styrene adsolubilization isotherm in Triton X-100 surfactant	24
4.3	FTIR spectra of polystyrene standard and extracted material	25
4.4	FTIR spectra of polystyrene standard, Triton X-100, unmodified silica and modified silica	26

FIGURE	PAGE
4.5 (a) Thermogram of Triton X-100, (b) thermogram of extracted polystyrene, (c) thermogram of modified silica, (d) thermogram of extracted silica	27
4.6 Weight average molecular weight ( $\overline{M}_w$ ) of extracted polystyrene formed at the level of 50 $\mu\text{mol/g}$ adsorbed Triton X-100 on silica	30
4.7 Weight average molecular weight ( $\overline{M}_w$ ) of extracted polystyrene formed at the level of 100 $\mu\text{mol/g}$ adsorbed Triton X-100 on silica	31
4.8 Atomic force micrograph of unmodified silica	32
4.9 Atomic force micrograph of silica modified by an adsorbed Triton X-100 100 $\mu\text{mol/g}$ to adsolubilized styrene 600 $\mu\text{mol/g}$ . (1:6)	33
4.10 Atomic force micrograph of silica modified by an adsorbed Triton X-100 100 $\mu\text{mol/g}$ to adsolubilized styrene 500 $\mu\text{mol/g}$ . (1:5)	33
4.11 Thickness of polystyrene film measured on silica modified by adsorbed Triton X-100 100 $\mu\text{mol/g}$ to adsolubilized styrene 600 $\mu\text{mol/g}$ . (1:6)	34
4.12 Atomic force micrograph of silica modified by an adsorbed Triton X-100 100 $\mu\text{mol/g}$ to adsolubilized styrene 400 $\mu\text{mol/g}$ . (1:4)	34
4.13 Thickness of polystyrene film measured on silica modified by adsorbed Triton X-100 100 $\mu\text{mol/g}$ to adsolubilized styrene 400 $\mu\text{mol/g}$ . (1:4)	35

<b>FIGURE</b>		<b>PAGE</b>
4.14	Atomic force micrograph of silica modified by an adsorbed Triton X-100 100 $\mu\text{mol/g}$ to adsolubilized styrene 200 $\mu\text{mol/g}$ . (1:2)	35
4.15	Thickness of polystyrene film measured on silica modified by an adsorbed Triton X-100 100 $\mu\text{mol/g}$ to adsolubilized styrene 200 $\mu\text{mol/g}$ (1:2)	36
4.16	Atomic force micrograph of silica modified by an adsorbed Triton X-100 100 $\mu\text{mol/g}$ to adsolubilized styrene 50 $\mu\text{mol/g}$ . (2:1)	36
4.17	Atomic force micrograph of silica modified by an adsorbed Triton X-100 50 $\mu\text{mol/g}$ to adsolubilized styrene 25 $\mu\text{mol/g}$ . (2:1)	37
4.18	The extracted silica	38