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**SYNTHESIS OF SUPER-FINE PARTICLES OF POLY(STYRENE-CO-METHYL
METHACRYLATE) BY SPG EMULSION POLYMERIZATION**



MISS ROONGKAN NUISIN

สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

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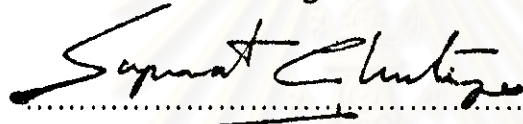
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Department Petrochemistry and Polymer Science
Thesis Advisor Associate Professor Suda Kiatkamjornwong, Ph.D.
Thesis Co-advisor Professor Shinzo Omi, Ph.D.


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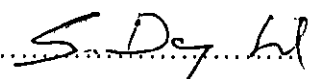

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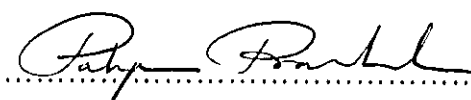
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..... Thesis Advisor
(Associate Professor Suda Kiatkamjornwong, Ph.D.)


..... Thesis Co-advisor
(Professor Shinzo Omi, Ph.D.)


..... Member
(Professor Somsak Damronglerd, Ph.D.)


..... Member
(Professor Patt-arapan Prasassarakich, Ph.D.)

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สไตรีนและเมทิลเมทาคริเลตโดยการเกิดพอลิเมอร์แบบเอสพีจีอิมัลชัน .อ. ที่
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ได้เตรียมพอลิสไตรีนโคพอลิเมทิลเมทาคริเลต ที่มีขนาดอนุภาคเท่า ๆ กัน โดยการใช้เอสพีจีเมมเบรน หยดของมอนอเมอร์ขนาดเท่า ๆ กัน เกิดขึ้นได้เมื่อมอนอเมอร์ได้ขับผ่านรูพรุนของเมมเบรนภายใต้การควบคุมความดันของแก๊สไนโตรเจน หยดมอนอเมอร์ซึ่งประกอบด้วยมอนอเมอร์เป็นส่วนใหญ่ ตัวเติมไม่ชอบน้ำ และตัวเร่งแขวนลอยอยู่ในวัฏภาคของน้ำที่มีสเตรปีไลเซอร์และตัวยับยั้งบรรจุอยู่ หลังจากนั้นได้ถ่ายอิมัลชันสู่ถังปฏิกรณ์ และทำปฏิกิริยาซัสเพนชันพอลิเมอร์เซชัน ณ 75 องศาเซลเซียส ภายใต้บรรยากาศไนโตรเจนเป็นเวลา 24 ชั่วโมง อนุภาคขนาดเท่า ๆ กันของพอลิสไตรีนโคพอลิเมทิลเมทาคริเลต ที่มีเส้นผ่านศูนย์กลางในช่วง 7 ถึง 14 ไมโครเมตร และมีการกระจายของขนาดอนุภาคแคบ โดยมีค่าสัมประสิทธิ์ของการเปลี่ยนแปลงใกล้เคียงกันร้อยละ 10 เมื่อใช้เมมเบรนที่มีรูพรุน 1.42 ไมโครเมตร ผลของสารเชื่อมขวางตัวเติมไม่ชอบน้ำ ชนิดของตัวเร่ง องค์ประกอบของโคพอลิเมอร์ และการเติมมอนอเมอร์แอลคิลเมทาคริเลต ต่อขนาด การกระจายขนาดอนุภาค และสัณฐานวิทยาของอนุภาค พบว่าขนาดของอนุภาคลดลงและมีการกระจายของขนาดอนุภาคแคบเมื่อเปลี่ยนตัวเติมจากแอลเคนโซยาว เป็นแอลกอฮอล์โซยาว และเอสเตอร์โซยาวตามลำดับ การเกิดอนุภาคขนาดเล็กที่มีความหลากหลายทางสัณฐานวิทยาขึ้นอยู่กับองค์ประกอบในวัฏภาคของน้ำมัน และยังพบว่า อนุภาคที่มีรูปร่างกลมของพอลิสไตรีนโคพอลิเมทิลเมทาคริเลต สามารถเตรียมได้เมื่อใช้ปริมาณของสารเชื่อมขวางที่เหมาะสม และใช้เมทิลพาล์มิเทตเป็นตัวเติม ยิ่งกว่านั้น ค่าอุณหภูมิสภาพแก้วของโคพอลิเมอร์สามารถควบคุมได้โดยการเปลี่ยนแปลงสัดส่วนของมอนอเมอร์แอลคิลเมทาคริเลต

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ลายมือชื่อนิสิต R. Naisin
ลายมือชื่ออาจารย์ที่ปรึกษา Jan Kiatkietkiet
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Relatively uniform microspheres of poly(styrene-co-methyl methacrylate) were prepared employing a microporous glass membrane (Shirasu porous glass; SPG). The uniform monomer droplets were produced when monomer was allowed to permeate through the membrane pores under a controlled nitrogen pressure. The monomer droplets composed mainly of monomers, hydrophobic additives, and oil-soluble initiator, were suspended in the aqueous phase containing stabilizer and inhibitor, then transferred to a reactor, and subsequent suspension polymerization followed. The droplets obtained were polymerized at 75°C under a nitrogen atmosphere for 24 h. The uniform poly(styrene-co-methyl methacrylate) microspheres with diameters ranging from 7-14 μm , and a narrow particle size distribution with a coefficient of variation close to 10% were prepared using membranes pore size 1.42 μm . The effects of crosslinking agent, hydrophobic additives, oil-soluble initiator, the composition of the copolymer, and the addition of alkyl methacrylate monomers on the particles size, particle size distribution, morphologies were investigated. It was found that the particles size decreased with a narrow size distribution when the additives were changed from long-chain alkane to long-chain alcohols and long-chain esters, respectively. Various microspheres with different morphologies were obtained, depending on the composition of the oil phase. The spherical poly(styrene-co-methyl methacrylate) particles without phase separation was obtained when using an adequate amount of crosslinking agent and methyl palmitate as additive. Furthermore, the glass transition temperature (T_g) of copolymer can be controlled by the various fractions of lower T_g monomer of alkyl methacrylate monomers.

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สาขาวิชา.....
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ลายมือชื่อนิสิต..... R. Nuisin
ลายมือชื่ออาจารย์ที่ปรึกษา..... Suda Kiatkamjornwong
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....



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ABBREVIATIONS

SPG	Shirasu porous glass
St	styrene
MMA	methyl methacrylate
n-BMA	n-butyl methacrylate
2-EHMA	2-ethylhexyl methacrylate
EGDMA	ethyleneglycol dimethacrylate
DVB	divinylbenzene
BPO	benzoyl peroxide
AIBN	2,2'-azo-bis-isobutyronitrile
ADVN	2,2'-azo-bis-2,4-dimethylvaleronitrile
HD	hexadecane
HD-OH	1-hexadecanol
MP	methyl palmitate
BW	bees wax
μm	micrometer
nm	nanometer
wt	weight
\bar{D}_m	membrane pore diameter
P_c	critical pressure
γ	interfacial tension
\bar{D}_e	average diameter of emulsion droplets
\bar{D}_p	average diameter of polymer particles
σ	standard deviation
CV	coefficient of variation
\bar{M}_n	number-average molecular weight
\bar{M}_w	weight-average molecular weight
k_d	decomposition rate constant of initiator
f	feed composition
F	copolymer composition

ABBREVIATIONS (Continued)

T _g	glass transition temperature
δ	chemical shift
OM	optical microscopy
SEM	scanning electron microscopy
GPC	gel permeation chromatography
NMR	nuclear magnetic resonance spectroscopy
DSC	differential scanning calorimetry
FT-IR	Fourier-transform infrared spectroscopy



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