

**ADMICELLAR POLYMERIZATION OF POLYCAPROLACTONE-  
POLYLACTIDE ON NATURAL RUBBER LATEX PARTICLES AND ITS  
NANOCOMPOSITES WITH NANOCCLAY**

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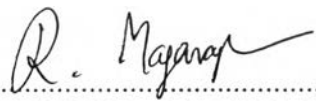
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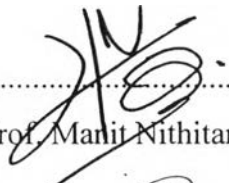
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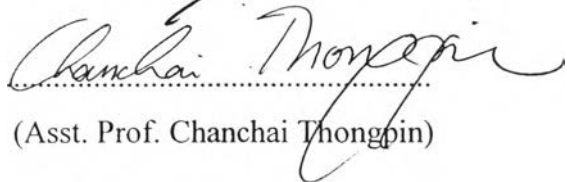
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## ABSTRACT

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Watit Wongphonchai: Admicellar Polymerization of Polycaprolactone-poly lactide on Natural Rubber Latex Particles and its Nanocomposites with Nanoclay.

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Natural rubber was modified its surface by core-shell particle formation via admicellar polymerization by using polycaprolactone-poly lactide copolymer as shell layer. Effect of particle factor, monomers ratio and initiator to monomers ratio, were observed for morphology, size, chemical function and thermal stability of admicelled particles. Then, it was incorporated with organoclay to become nanocomposite and using for PLA toughness modification. Effects of the particles factors and clay content were observed for mechanical and thermal properties of blends. Optical and transmission electron microscope revealed that core-shell structure of admicelled particles. That mean core-shell particles of natural rubber can be prepared via admicellar polymerization. IR spectra of shell layer showed characteristic peaks of PCL and PLA and also showed pattern of copolymer. TGA thermogram showed that the shell polymer did not sufficiently improve thermal stability of rubber core because there is only single decomposition which amazingly reveals good miscibility of the three components. DMA result showed that glass transition temperature ( $T_g$ ) of the two components shifted close together, that means two components were more compatible. Impact testing showed that the particles with a high initiator to monomers ratio cause increasing of PLA's Impact force. Organoclay addition into admicelled rubber improved miscibility and storage modulus of blends in DMA, but impact force decreased severely.

## บทคัดย่อ

วาทิต วงศ์พรชัย : การสังเคราะห์ด้วยแอคไมเซลาร์พอลิเมอไรเซชันของพอลิคาโพร-  
 แล็กโทน-พอลิแล็กไทด์บนอนุภาคยางธรรมชาติ และนาโนคอมโพสิต (Admicellar  
 polymerization of polycaprolactone-poly(lactide) on natural rubber latex particles and  
 its nanocomposites with nanoclay) อ. ที่ปรึกษา : รศ.ดร. รัตนาวรรณ มกรพันธุ์ 86 หน้า

อนุภาคยางธรรมชาติถูกปรับปรุงพื้นผิวด้วยการเคลือบด้วยโคพอลิเมอร์ของพอลิคาโพร-  
 แล็กโทนและพอลิแล็กไทด์ผ่านกระบวนการแอคไมเซลาร์พอลิเมอไรเซชัน และศึกษาผลจากการ  
 ผันแปรสัดส่วนของมอนอเมอร์ทั้งสองและสัดส่วนของสารริเริ่มปฏิกิริยาต่อมอนอเมอร์ต่อรูปร่าง  
 ขนาด ฟังก์ชันทางเคมี และเสถียรภาพทางความร้อนของอนุภาคสังเคราะห์ จากนั้นอนุภาค  
 สังเคราะห์จะถูกรวมเข้ากับแร่ดินเหนียวเพื่อทำเป็นวัสดุนาโนคอมโพสิต และนำไปใช้เพื่อการ  
 ปรับปรุงความเหนียวของพอลิแล็กไทด์ แล้วทำการศึกษาผลของการผันแปรสัดส่วนของมอนอ-  
 เมอร์ทั้งสอง สัดส่วนของสารริเริ่มปฏิกิริยาต่อมอนอเมอร์ และปริมาณของแร่ดินเหนียวที่มีต่อ  
 สมบัติเชิงกลและสมบัติเชิงความร้อน กล้องจุลทรรศน์แบบแสงและกล้องจุลทรรศน์อิเล็กตรอน  
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 แล็กโทนและพอลิแล็กไทด์ และยังแสดงให้เห็นลักษณะของการเป็นโคพอลิเมอร์อีกด้วย การ  
 วิเคราะห์ทางความร้อนแสดงให้เห็นว่าพอลิเมอร์ส่วนเปลือกของอนุภาคแอคไมเซลาร์ไม่ได้  
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**ABBREVIATIONS**

CL	$\epsilon$ -Caprolactone
CTAB	Cetyltrimethylammonium bromide
DMA	Dynamic mechanical analysis
LA	Lactide monomers
NR	Natural rubber
PCL	Polycaprolactone
PLA	Poly lactide
TGA	Thermogravimetric analysis
Sn(Oct) <sub>2</sub>	Tin(II) 2-ethylhexanoate, stannous octoate