

**NANOCLAY/POLYPROPYLENE COMPOSITE FOR ETHYLENE AND
CARBON DIOXIDE SCAVENGING FILMS**



Tantika Aksonnum

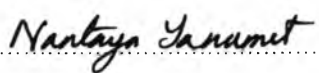
A Thesis Submitted in Partial Fulfilment of the Requirements
for the Degree of Master of Science
The Petroleum and Petrochemical College, Chulalongkorn University
in Academic Partnership with
The University of Michigan, The University of Oklahoma,
and Case Western Reserve University

2008


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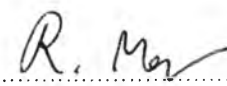
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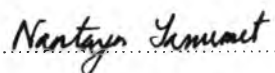

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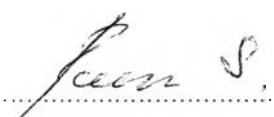
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บทคัดย่อ

ทัศนิกา อักษรนำ : บรรจุภัณฑ์พอลิพรอพิลีนนาโนเคลย์คอมพอสิตดักจับก๊าซเอทริลีนและคาร์บอนไดออกไซด์ (Nanoclay Polypropylene Composite for Ethylene and Carbon Dioxide Scavenging Films) อ. ที่ปรึกษา : ผศ.ดร.หทัยกานต์ มนต์ปิยะ, รศ.ดร.รัตนวรรณ มกรพันธุ์ และ ผศ.ดร.มานิตย์ นิธิธนากุล 72 หน้า

แร่ดินเหนียวโซเดียม-เบนโทไนท์ทำปฏิกิริยาแลกเปลี่ยนไอออนกับสารลดแรงตึงผิว Stepantex™ SP-90 กลายเป็นออร์กาโนเคลย์เบนโทไนท์และใช้ 3-อะมิโนโพรพิลไตรเมทอกซีไซเลนเพื่อช่วยขยายชั้นของแร่ดินเหนียวให้มีประสิทธิภาพยิ่งขึ้น จากนั้นนำไปผสมกับพอลิพรอพิลีน และออลูมิเนียมไฮดรอกไซด์หรือแคลเซียมไฮดรอกไซด์ โดยใช้เซอร์ลีนไอโอโนเมอร์เป็นสารช่วยผสม โดยที่ออลูมิเนียมไฮดรอกไซด์และแคลเซียมไฮดรอกไซด์เป็นตัวช่วยดูดซับก๊าซเอทริลีนและคาร์บอนไดออกไซด์ เมื่อนำมาผสมกับออร์กาโนเคลย์เบนโทไนท์เพื่อเพิ่มประสิทธิภาพในการดักจับก๊าซดังกล่าว ส่วนการขึ้นรูปนั้นใช้วิธีการเป่าขึ้นรูปกลายเป็นบรรจุภัณฑ์ถุงพลาสติกเมื่อออร์กาโนเคลย์ถูกตรวจสอบโดยใช้ XRD และ FT-IR พบว่าระยะห่างระหว่างชั้นของแร่ดินเหนียวเพิ่มมากขึ้นหลังจากทำปฏิกิริยากับสารลดแรงตึงผิว อีกทั้งอุณหภูมิการสลายตัวของพอลิพรอพิลีนนาโนคอมโพสิตเพิ่มสูงขึ้น เมื่อเพิ่มปริมาณของออร์กาโนเคลย์ และจากการศึกษาคุณสมบัติเชิงกลพบว่า ออร์กาโนเคลย์มีผลต่อการเปลี่ยนแปลงค่ามอดูลัสของยัง โดยมีแนวโน้มสูงขึ้น แต่ค่าความสามารถในการยืดจนขาดมีค่าลดลง ซึ่งบรรจุภัณฑ์ที่ได้นี้สามารถใช้กับผลไม้สดเพื่อช่วยยืดอายุในการเก็บรักษาให้นานขึ้นจากการดักจับก๊าซเอทริลีนและคาร์บอนไดออกไซด์

ABSTRACT

4972034063: Polymer Science Program

Tantika Aksonnum: Nanoclay/Polypropylene Composite for Ethylene and Carbon Dioxide Scavenging Films.

Thesis Advisors: Asst. Prof. Hathaikarn Manuspiya, Asst. Prof.

Rathanawan Magaraphan, and Asst. Prof. Manit Nithitanakul

72 pp.

Keywords: Polypropylene/ Bentonite/ Montmorillonite/ Nanocomposite /Active Packaging/ Ethylene Scavenger

Na-bentonite was treated with a surfactant (Stepantex™ SP-90) in order to prepare organobentonite; and 3-aminopropyltrimethoxysilane was also added to act as surface treatment. Because aluminum hydroxide and calcium hydroxide can enhance ethylene and carbon dioxide removal capacity, respectively, organobentonite and aluminum hydroxide/calcium hydroxide were incorporated into polypropylene with a compatibilizer (Surlyn® ionomer) in a twin screw extruder and fabricated into films by the blow film extrusion process. The organomodified-BTN was characterized by XRD and FTIR. The d-spacing of the organoclay increased when the surfactant was added and the C=O bond and -CH₂ of the surfactant occurred at 1740 and 2921 cm⁻¹, respectively. The degradation temperatures of those films were improved. The mechanical properties of the nanocomposite films were also investigated. When the present clay content of the organomodified-BTN was increased, it enhanced the Young's modulus but decreased other tensile properties. Packaging films made of PP/organomodified-BTN can prolong the shelf-life of fresh fruit as the organomodified-BTN showed the potential for being an ethylene and carbon dioxide scavenger.

ACKNOWLEDGEMENTS

This thesis work is funded by the Petroleum and Petrochemical College; and the National Excellence Center for Petroleum, Petrochemicals, and Advanced Materials, Thailand. The author would like to thank Thai Nippon Co., Ltd for providing clay mineral through out this research, and also, Tang Packaging Co., Ltd for fabricated active packaging films by blow film extrusion machine. Moreover, Dr. Vivian Thammongkol, Petroleum authority of Thailand, and all staffs from PPT Chemical Public Company Limited, for providing ethylene gas. Furthermore, a special thank to faculty of Natural Resources, KMUTT for gas permeability tester.

The author is deeply indebted to her advisor; Asst. Dr. Hathaikarn Manuspiya, Assoc. Prof. Rathanawan Magaraphan and Asst. Prof. Manit Nithitnakul, for help, stimulating suggestions, and continuous support her in all the time of research. Moreover, the author would like to give special thank to Assoc. Prof. Nantaya Yanumet and Assoc. Prof. Punnama Siriphannon for serving on her thesis committee.

The author also thank all of the Petroleum and Petrochemical College's faculties and staffs for invaluable assistance, and a deeply thanks to Assoc. Prof. Sirirat Jitkarnka for gas chromatography measurement.

Many thanks are due to her PPC colleagues for their friendship, helpfulness, encouragement, and suggestions. Also, her parent and family are the most important people, who give her support and understanding. Without them, the completion of this research would not been possible.

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