

**ACTIVE PACKAGING BASED ON ETHYLENE SCAVENGER
PP / ORGANOMODIFIED CLAY NANOCOMPOSITES**

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ABSTRACT

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Ethylene scavenger active packaging is used for extend the shelf-life of fresh fruits and vegetables. In this work, Na-bentonite was treated with DOEM surfactant in order to prepare organommodified bentonite. The organommodified bentonite was compounded with polypropylene by using Surlyn® ionomer as a compatibilizer. Aluminum hydroxide and aluminum acetate were added to the composites to enhance the ethylene removal capacity. The composites were fabricated in the form of packaging film by using the blow film extrusion method. The organommodified bentonite was characterized by using XRD and FT-IR. The d-spacing of the organommodified bentonite increased after treating with DOEM surfactant. The ethylene gas removal capacity of organommodified bentonite was determined by Gas Chromatography. The degradation temperatures of the nanocomposite packaging films were improved. The mechanical properties of nanocomposite packaging films were investigated. Increased organommodified bentonite loading enhanced the elastic modulus but decreased other tensile properties. SEM images showed the dispersion of organommodified bentonite with ethylene scavenger on the nanocomposite films and TEM image showed that both intercalation and exfoliation are occurred in the PP/organommodified bentonite active packaging films. Ethylene gas permeability of the nanocomposite films decreased when compared to polypropylene film.

บทคัดย่อ

ยุกันธร วโรทัย : บรรจุภัณฑ์พอลิพรอพิลีนนาโนคอมพอสิตดักจับก๊าซเอทธิลีน (Active Packaging Based on Ethylene Scavenger PP / Organomodified Clay Nanocomposites) อ. ที่ปรึกษา : ดร.หทัยกานต์ มนัสปิยะ, รศ.ดร.รัตนวรรณ มกรพันธุ์ และ ผศ.ดร.มานิตย์ นิธิธนากุล 89 หน้า

บรรจุภัณฑ์ดักจับก๊าซเอทธิลีนสามารถช่วยยืดอายุการเก็บรักษาผลไม้และผักสดไว้ได้นานขึ้น ในงานวิจัยนี้แร่ดินเหนียวเบนโทไนท์ทำปฏิกิริยาแลกเปลี่ยนไอออนกับสารลดแรงตึงผิว DOEM เพื่อให้ได้ออร์กาโนเคลย์เบนโทไนท์ จากนั้นนำไปผสมกับพอลิพรอพิลีน โดยใช้เซอริลีนไอโอโนเมอร์เป็นสารช่วยผสม อลูมิเนียมไฮดรอกไซด์และอลูมิเนียมอะซิเตทถูกนำมาผสมกับออร์กาโนเคลย์เบนโทไนท์เพื่อเพิ่มประสิทธิภาพในการดักจับก๊าซเอทธิลีน บรรจุภัณฑ์ถุงพลาสติกถูกขึ้นรูปด้วยวิธีเป่าขึ้นรูป ออร์กาโนเคลย์ถูกตรวจสอบโดยใช้ XRD และ FT-IR พบว่าระยะห่างระหว่างชั้นของแร่ดินเหนียวเพิ่มมากขึ้นเมื่อทำปฏิกิริยากับสารลดแรงตึงผิว วิธี Gas Chromatography ใช้ในการวัดความสามารถในการกำจัดก๊าซเอทธิลีนของแร่ดินเหนียว อุณหภูมิการสลายตัวของพอลิพรอพิลีนนาโนคอมพอสิตเพิ่มสูงขึ้น เมื่อปริมาณออร์กาโนเคลย์เพิ่มมากขึ้น มอดูลัสเพิ่มขึ้นแต่ค่าความทนแรงดึงลดลง ภาพ จาก SEM แสดงการกระจายของออร์กาโนเคลย์และสารกำจัดก๊าซเอทธิลีน ภาพจาก TEM แสดงการแทรกตัวของพอลิเมอร์ในชั้นแร่ดินเหนียว และการแตกกระจายของแร่ดินเหนียวในพอลิพรอพิลีนนาโนคอมพอสิต ค่าการซึมผ่านของก๊าซเอทธิลีนลดลงเมื่อเปรียบเทียบกับพอลิพรอพิลีน

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