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ห่อหุ้มด้วยเจลลาติน



นางสาว นริศรา ศรีเคลือบ

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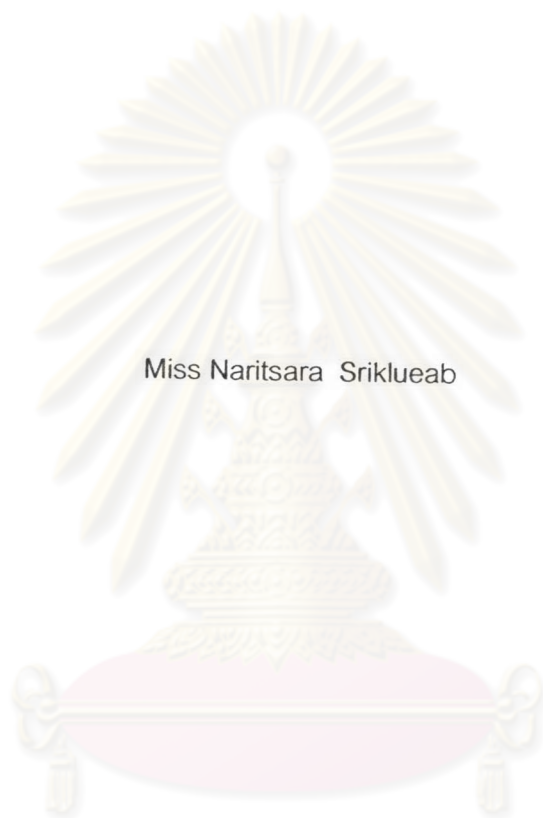
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PHOTODEGRADATION OF LDPE CONTAINING GELATIN  
ENCAPSULATED BENZOPHENONE



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พอลิเอทิลีนความหนาแน่นต่ำนิยมใช้กันอย่างแพร่หลายในอุตสาหกรรมบรรจุภัณฑ์ ซึ่งถูกออกแบบให้ทนทานต่อการย่อยสลายได้เองตามธรรมชาติด้วยสาเหตุนี้จึงก่อให้เกิดปริมาณขยะเป็นจำนวนมาก ดังนั้นงานวิจัยนี้จึงได้ศึกษาการควบคุมการย่อยสลายด้วยแสงของพอลิเอทิลีนความหนาแน่นต่ำโดยใช้เบนโซฟีโนนที่ถูกห่อหุ้มด้วยเจลาตินภายใต้ภาวะการตากแดดกลางแจ้งและภาวะเร่ง โดยทำการศึกษากการย่อยสลายด้วยแสงของฟิล์มพอลิเอทิลีนความหนาแน่นต่ำและฟิล์มพอลิเอทิลีนความหนาแน่นต่ำที่ใส่สารเติมแต่งด้วยการติดตามผลการเปลี่ยนแปลงของน้ำหนักที่สูญเสียไป สมบัติเชิงกล และค่าดัชนีคาร์บอนิล และการเปลี่ยนแปลงของสัณฐานวิทยาด้วยกล้องจุลทรรศน์อิเล็กตรอนแบบส่องกราด

จากผลการทดลองพบว่าอนุภาคเจลาตินและเบนโซฟีโนนช่วยเร่งการย่อยสลายด้วยแสงของพอลิเอทิลีนความหนาแน่นต่ำได้แม้จะมีความสามารถที่แตกต่างกัน ฟิล์มพอลิเอทิลีนความหนาแน่นต่ำที่ใส่เจลาตินเกิดการย่อยสลายทางแสงอย่างช้าๆ เมื่อระยะเวลาในการตากแดดและปริมาณเจลาตินเพิ่มขึ้น ในขณะที่เบนโซฟีโนนมีผลต่อการย่อยสลายด้วยแสงอย่างมาก ฟิล์มพอลิเอทิลีนความหนาแน่นต่ำที่ใส่เบนโซฟีโนนเกิดการย่อยสลายทางแสงดีกว่าฟิล์มพอลิเอทิลีนความหนาแน่นต่ำ และฟิล์มพอลิเอทิลีนความหนาแน่นต่ำที่ใส่เจลาตินโดยอัตราการย่อยสลายจะเพิ่มขึ้นเมื่อระยะเวลาในการตากแดดและปริมาณเบนโซฟีโนนเพิ่มขึ้น

เบนโซฟีโนนห่อหุ้มด้วยเจลาตินถูกผลิตโดยวิธีซิมเพลคเซอเวชันเพื่อควบคุมอัตราการปลดปล่อยของเบนโซฟีโนน เพื่อที่จะควบคุมความหนาของวัสดุเคลือบผิวได้ศึกษาปัจจัยที่สำคัญ 2 ประการคือ อัตราส่วนระหว่างปริมาณเบนโซฟีโนนและเจลาติน และปริมาณฟอร์มาดีไฮด์ผลจากสมบัติเชิงกลและค่าดัชนีคาร์บอนิลแสดงให้เห็นว่าอัตราการย่อยสลายทางแสงสามารถควบคุมได้ด้วยการเปลี่ยนแปลงอัตราส่วนระหว่างปริมาณเบนโซฟีโนนและเจลาติน โดยอัตราการย่อยสลายด้วยแสงเพิ่มขึ้นเมื่อลดปริมาณเจลาตินในอัตราส่วนระหว่างปริมาณเบนโซฟีโนนและเจลาติน ฟิล์มพอลิเอทิลีนความหนาแน่นต่ำที่มีเบนโซฟีโนนห่อหุ้มด้วยเจลาติน EN1 สามารถย่อยสลายได้เร็วกว่า ฟิล์มพอลิเอทิลีนความหนาแน่นต่ำที่มีเบนโซฟีโนนห่อหุ้มด้วยเจลาติน EN2 และ EN3 ตามลำดับนอกจากนี้พบว่าปริมาณของฟอร์มาดีไฮด์ไม่มีผลต่ออัตราการย่อยสลายทางแสงของฟิล์มพอลิเอทิลีนความหนาแน่นต่ำ

ภาควิชาวัสดุศาสตร์

ลายมือชื่อนิสิต..... นริศรา ศรีเคลือบ

สาขาวิชาพอลิเมอร์ประยุกต์และเทคโนโลยีสิ่งทอ

ลายมือชื่ออาจารย์ที่ปรึกษา.....

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##4572336323: MAJOR APPLIED POLYMER SCIENCE AND TEXTILE TECHNOLOGY

KEYWORD: PHOTODEGRADABLE, BENZOPHENONE, COACERVATE, ENCAPSULATION

NARITSARA SRIKLUEAB: PHOTODEGRADATION OF LDPE CONTAINING GELATIN ENCAPSULATED BENZOPHENONE. THESIS ADVISOR: ASST. PROF. DUANGDAO AHT-ONG, Ph. D., 133 pp. ISBN 974-53-1357-2

Low Density Polyethylene (LDPE) is the most widely used packaging polymers and these products are designed and manufactured to resist environmental degradation that can generate a great amount of waste. The aim of this research was to control photodegradation of LDPE by incorporating encapsulated particles of benzophenone. The photodegradation was estimated by outdoor exposure test and accelerated weathering test. The progress in photodegradation of pure LDPE films and LDPE films containing additives were followed by observing the changes in weight loss, tensile properties, and carbonyl index (CI) of the films. The morphological change of the films was followed by scanning electron microscopy (SEM).

From the results, it was found that both gelatin and benzophenone can promote the photodegradation of LDPE film, although with different magnitude. The photodegradation of LDPE/gelatin film slightly increased with an increase of exposure time and gelatin concentration. However, benzophenone has a very high influence on photodegradation. The photodegradation of LDPE/benzophenone film was greater than pure LDPE and LDPE/gelatin films and rapidly increased with increasing exposure time and benzophenone concentration.

Encapsulated benzophenone was prepared by simple coacervation method to control the releasing rate of benzophenone. In order to control the thickness of coating material, two factors; i.e., the ratios of benzophenone to gelatin and the amount of formaldehyde, were investigated. Based on the tensile properties and carbonyl index values, it can be concluded that the photodegradation rate increased with decreasing the gelatin in the ratio of benzophenone to gelatin. LDPE film containing EN1 microcapsule degraded faster than LDPE film containing EN2 and EN3, respectively. In addition, it was found that the amount of formaldehyde had no effect on the photodegradation rate.

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ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

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