


การสลายตัวทางชีวภาพและการสลายตัวด้วยแสงของฟิล์มพอลิเอทิลีน
ความหนาแน่นต่ำ/แป้งกล้วย



นางสาวอุษารัตน์ รัตนคำนวน

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จุฬาลงกรณ์มหาวิทยาลัย

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต

สาขาวิชาวิทยาศาสตร์พอลิเมอร์ประยุกต์และเทคโนโลยีสิ่งทอ ภาควิชาวัสดุศาสตร์


คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ปีการศึกษา 2545

ISBN 974-17-3231-7

ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

PHOTO-BIODEGRADATION OF LDPE/BANANA STARCH FILMS



Miss Usarat Ratanakamnoun

ศูนย์วิทยทรัพยากร

จุฬาลงกรณ์มหาวิทยาลัย

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Applied Polymer Science and Textile Technology

Department of Materials Science

Faculty of Science

Chulalongkorn University

Academic Year 2002

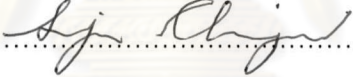
ISBN 974-17-3231-7

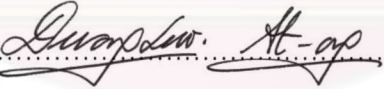
Thesis Title Photo-Biodegradation of LDPE/Banana Starch Films
By Miss Usarat Ratanakamnoun
Field of Study Applied Polymer Science and Textile Technology
Thesis Advisor Assistant Professor Duangdao Aht-Ong, Ph.D.

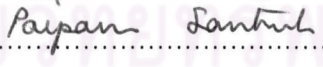
Accepted by the Faculty of Science, Chulalongkorn University in Partial
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อุษารัตน์ รัตนคำนวน : การสลายตัวทางชีวภาพและการสลายตัวด้วยแสงของฟิล์มพอลิเอทิลีน ความหนาแน่นต่ำ/แป้งกล้วย. (PHOTO-BIODEGRADATION OF LDPE/BANANA STARCH FILMS) อ. ที่ปรึกษา : ผศ.ดร. ดวงดาว อัจจงค์, 154 หน้า. ISBN 974-17-3231-7

งานวิจัยนี้เป็นการศึกษาผลของปริมาณแป้ง สารเร่งการสลายตัวด้วยแสงและสารช่วยผสม ที่มีต่อสมบัติความทนแรงดึง การสลายตัวทางชีวภาพและการสลายตัวด้วยแสงของฟิล์มพอลิเมอร์ผสมระหว่างพอลิเอทิลีนความหนาแน่นต่ำและแป้งกล้วย โดยมีพอลิเอทิลีนกราฟต์มาเลอิก แอนไฮไดรด์และเบนโซฟีโนนเป็นสารช่วยผสมและสารเร่งการสลายตัวด้วยแสงตามลำดับ ทำการขึ้นรูปฟิล์มโดยใช้แป้งกล้วยและเบนโซฟีโนนในปริมาณ 0-20 เปอร์เซ็นต์และ 0-1 เปอร์เซ็นต์โดยน้ำหนักของพอลิเอทิลีนความหนาแน่นต่ำตามลำดับ และใช้พอลิเอทิลีนกราฟต์มาเลอิกแอนไฮไดรด์ 10 เปอร์เซ็นต์โดยน้ำหนักของแป้งกล้วย ศึกษาสมบัติทางกายภาพและสมบัติความทนแรงดึง จากนั้นศึกษาการสลายตัวด้วยแสงของฟิล์มในภาวะธรรมชาติโดยการตากแดดกลางแจ้งและในภาวะเร่งโดยใช้เครื่องซีโนเทสต์เบตาแลมป์ ติดตามการสลายตัวด้วยแสงของฟิล์มโดยการวัดดัชนีการเกิดหมู่คาร์บอนิลด้วยเทคนิค FT-IR และการเปลี่ยนแปลงสมบัติความทนแรงดึง ศึกษาการสลายตัวทางชีวภาพของฟิล์มโดยการทดสอบด้วยเชื้อราและการฝังดิน และติดตามการสลายตัวทางชีวภาพด้วยการศึกษาการเปลี่ยนแปลงลักษณะทางกายภาพ การวัดการเปลี่ยนแปลงน้ำหนัก ตลอดจนการเปลี่ยนแปลงสมบัติความทนแรงดึง

ผลการศึกษาพบว่า ปริมาณแป้งกล้วยมีผลต่อสมบัติความทนแรงดึงและการสลายตัวของฟิล์ม การสลายตัวทางชีวภาพและการสลายตัวด้วยแสงของฟิล์มจะเพิ่มขึ้นเมื่อปริมาณแป้งกล้วยเพิ่มขึ้น ขณะที่สมบัติความทนแรงดึงมีค่าลดลง และพบว่าเบนโซฟีโนนเป็นสารเร่งการสลายตัวด้วยแสงที่มีประสิทธิภาพ การสลายตัวด้วยแสงของฟิล์มเพิ่มขึ้นเมื่อปริมาณเบนโซฟีโนนเพิ่มขึ้นแต่ส่งผลให้การสลายตัวทางชีวภาพของฟิล์มลดลง การเติมสารช่วยผสมทำให้สมบัติความทนแรงดึงเพิ่มขึ้นขณะที่อัตราการสลายตัวด้วยแสงและการสลายตัวทางชีวภาพลดลงเมื่อเทียบกับฟิล์มที่ไม่ได้เติมสารช่วยผสม

ภาควิชา วัสดุศาสตร์

สาขาวิชา วิทยาศาสตร์พอลิเมอร์ประยุกต์และเทคโนโลยีสิ่งทอ

ปีการศึกษา 2545

ลายมือชื่อผู้จัดทำ...อุษารัตน์ รัตนคำนวน.....

ลายมือชื่ออาจารย์ที่ปรึกษา........

4372501323 : MAJOR APPLIED POLYMER SCIENCE AND TEXTILE TECHNOLOGY

KEY WORD: BANANA STARCH / PE-g-MA / PHOTODEGRADATION / BIODEGRADATION / PHOTSENSITIZER / BENZOPHENONE

USARAT RATANAKMNOUN : PHOTO-BIODEGRADATION OF LDPE/BANANA STARCH FILMS
 THESIS ADVISOR : ASST. PROF. DUANGDAO AHT-ONG, Ph.D.
 154 pp. ISBN 974-17-3231-7.

The effects of starch content, photosensitizer content and compatibilizer on photo-biodegradability of polymer blend films from low-density polyethylene (LDPE) and banana starch were investigated. The compatibilizer and photosensitizer used in the films were polyethylene-graft-maleic anhydride (PE-g-MA) and benzophenone, respectively. Dried banana starch of 0-20% w/w of LDPE, benzophenone of 0-1% w/w of LDPE and PE-g-MA of 10% w/w of banana starch were added to LDPE. The photodegradation of the blend films was performed by an outdoor exposure and simulated condition in Xenotest Beta Lamp. The progress of photodegradation was followed by determining the carbonyl index derived from FT-IR measurement and the change in tensile properties. Biodegradation of the blend films was investigated by microbial degradation and soil burial test. Biodegradation process was followed by measuring the changes in physical appearance, weight loss and tensile properties of the films. The results showed that both photo- and biodegradation rates increased with increasing amount of banana starch, while the tensile properties of films decreased. The blends with higher amount of benzophenone showed higher rate of photodegradation, although their biodegradation rate was reduced with an increase in benzophenone content. The addition of PE-g-MA in polymer blends led to an increase in tensile properties whereas the photo-biodegradation slightly decreased compared to the films without PE-g-MA.

Department Materials Science

Field of study Applied Polymer Science and Textile Technology

Academic year 2002

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ACKNOWLEDGEMENT

I would like to express my deep gratitude to my advisor, Assistant Professor Dr. Duangdao Aht-Ong for her encouragement, consistent guidance, and for all that I have learnt from her throughout this research. I would also like to thank the thesis committee, Assoc. Prof. Saowaroj Chuayjuljit, Assoc. Prof. Paiparn Santisuk, Assoc. Prof. Dr. Werasak Udomkichdecha, and Assoc. Prof. Onusa Saravari for suggestion and serving on my thesis committee.

I would like to thank Cementhai Co., Ltd. for providing low-density polyethylene. Special thanks to Dr. Pitt Supapol and the Petroleum and Petrochemical College, Chulalongkorn University for the use of the chill-roll cast film. In addition, thank also go to Mr. Thanit Singhaboonpong at the Department of Microbiology, Faculty of Science, Chulalongkorn University for his kind assistance on the microbial degradation test.

I greatly appreciate the scholarship from the Ministry of University's Affairs for providing the financial support during my study.

Thanks to all my friends at the Department of Materials Science for their friendship and their help throughout my studies.

Finally, I would like to extend my deep appreciation to my dearest family for their love, care and encouragement, in particular, to my mom who has always been there for me. Many thanks for her understanding and her endless love

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