

**POLYPROPYLENE/ORGANOCLAY NANOCOMPOSITES
FOR pH-SENSITIVE PACKAGING**

Sakkarin Tassanawat

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By: Sakkarin Tassanawat
Program: Polymer Science
Thesis Advisors: Dr. Hathaikarn Manuspiya
Assoc.Prof. Rathanawan Magaraphan
Asst. Prof. Manit Nithitanakul

Accepted by the Petroleum and Petrochemical College, Chulalongkorn University, in partial fulfilment of the requirements for the Degree of Master of Science.

Nantaya Yanumet
..... College Director
(Assoc. Prof. Nantaya Yanumet)

Thesis Committee:

Hathaikarn M.
.....
(Dr. Hathaikarn Manuspiya)

R. Magaraphan
.....
(Assoc. Prof. Rathanawan Magaraphan)

Manit Nithitanakul
.....
(Asst. Prof. Manit Nithitanakul)

Nantaya Yanumet
.....
(Assoc. Prof. Nantaya Yanumet)

K. Sirisinha
.....
(Assoc. Prof. Kalyanee Sirisinha)

ABSTRACT

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Sakkarin Tassanawat: Polypropylene/Organoclay Nanocomposite for pH-sensitive Packaging.

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The processing of pH-sensitive material used for milk packaging based on polypropylene/organoclay nanocomposites incorporated with indicator dyes was focused on. The nanoclay composites with indicator dyes were compounded through a twin screw extruder using Surlyn[®] as a compatibilizer. The nanoclay composites were fabricated into the sample sheet for the color testing and characterizations including thermal and mechanical properties. Milk deterioration was assessed for titratable acidity (TA), and color changes of the films were measured and expressed as Hunter values as well as total color difference (TCD). TCD values of BMB (Bromothymol blue) type- and BP (Bromocresol purple) type-films also changed continuously with the response of the film. The color changes of the films correlated well with TA value of fresh milk. According to the changes in Hunter color values of the films within the packages of fresh milk during storage at ambient temperature, the result shows that the color of BMB type-film turned from green to yellow whereas those of BP type-film turned from violet to green. The color changes of the developed indicator properly represented the degree of deterioration of fresh milk. Consequently, the nanocomposite indicator film could be employed an effective smart packaging technology for evaluating fresh milk.

บทคัดย่อ

ศักรินทร์ ทัศนวัฒน์: พอลิพรอพิลีนนาโนคอมโพสิต (Polypropylene/Organoclay Nanocomposites for pH-Sensitive Packaging) อ. ที่ปรึกษา: ดร.หทัยกานต์ มนต์ปิยะ, รศ.ดร. รัตนาวรรณ มกรพันธุ์ และ ศศ.ดร.มานิตย์ นิธิธนากุล 67 หน้า

การผลิตวัสดุที่ไวต่อการเปลี่ยนแปลงความเป็นกรด-เบสเพื่อใช้ในผลิตภัณฑ์นมโดยใช้พอลิพรอพิลีน เคลย์ นาโนคอมโพสิตรวมกับการใส่เม็ดสีอินดิเคเตอร์ เพื่อใช้เป็นเครื่องบอกระดับความเสียของนม ช่วยให้ผู้บริโภคสะดวกที่จะทราบว่านมนั้นเสียหรือไม่ เพียงแค่ดูสีของฟิล์มเท่านั้น ฟิล์มอินดิเคเตอร์ผลิตโดยใช้เครื่องอัดรีดแบบเกลียวคู่ โดยมีเซอร์ลินเป็นตัวเชื่อมประสานและขึ้นรูปเพื่อใช้ในการทดสอบเชิงกลและทางความร้อน เมื่อนมเสีย จะมีการผลิตกรดแลคติกขึ้นทำให้พีเอชลดลงจาก 6.8 ถึง 5.2 ค่าความเสียของนมถูกทดสอบโดยค่าความเป็นกรดจากการไตเตรทและการเปลี่ยนแปลงของสีถูกทดสอบโดยค่าเปลี่ยนแปลงของสีทั้งหมด โดยสีของฟิล์มชนิดโบรโมครีซอล เพอร์เฟิล เปลี่ยนจากสีม่วงเป็นสีเขียว ส่วนสีของฟิล์มชนิดโบรโมไรมอล บลู จะเปลี่ยนจากสีเหลืองเป็นสีเขียว ซึ่งฟิล์มนี้สามารถความสัมพันธ์ระหว่างการเปลี่ยนแปลงที่เกิดขึ้นในผลิตภัณฑ์กับการเปลี่ยนแปลงสีของอินดิเคเตอร์ได้ ดังนั้น ฟิล์มนาโนคอมโพสิตอินดิเคเตอร์สามารถใช้เป็นวัสดุที่ไวต่อการเปลี่ยนแปลงความเป็นกรด-เบสในช่วง 6.8-5.2 เพื่อใช้ในผลิตภัณฑ์นมได้อย่างมีประสิทธิภาพ

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