

**SMART PACKAGING FROM PLASTIC/NANOCOPPER
NANOCOMPOSITE**

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A Thesis Submitted in Partial Fulfillment 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

2012

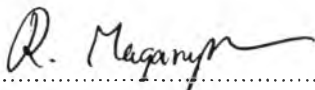
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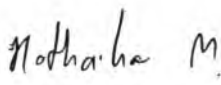
Thesis Title: Smart Packaging from Plastic/nanocopper Nanocomposite
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Program: Polymer Science
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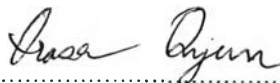
Accepted by The Petroleum and Petrochemical College, Chulalongkorn University, in partial fulfilment of the requirements for the Degree of Master of Science.


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พิชญา เณรรักษา : บรรจุภัณฑ์ฉลาดจากวัสดุคอมพอสิตระหว่างพลาสติกและคอปเปอร์ขนาดนาโนเมตร (Smart Packaging from Plastic/nanocopper Nanocomposite)
อ. ที่ปรึกษา : รศ.ดร. รัตนวรรณ มกรพันธุ์ 134 หน้า

งานวิจัยนี้มีเป้าหมายในการพัฒนาฟิล์มบรรจุภัณฑ์ฉลาดจากฟิล์มพอลิพรอไพลีน ซึ่งมี การผสมอนุภาคนาโนเมตรของเรตินเบนโตไนด์และคอปเปอร์ปริมาณ 1 เปอร์เซ็นต์โดย น้ำหนัก เพื่อประโยชน์ทางการซึมผ่านของก๊าซและการต้านเชื้อแบคทีเรีย คอปเปอร์ขนาดนา โนเมตรถูกสังเคราะห์ด้วยวิธีสังเคราะห์ขั้นต้นคนเดียวจากสารละลายคอปเปอร์ (II) ในเตรด โดยมี กรดแอสคอบิกเป็นตัวรีดิวซ์ และมีพอลิไวนิลไพโรลิโดนเป็นสารช่วยการกระจายตัว คอปเปอร์ ขนาดนาโนเมตรที่สังเคราะห์ได้มีขนาดเส้นผ่านศูนย์กลางเฉลี่ย 6 นาโนเมตรซึ่งผลการศึกษา XRD ยืนยันฟิสิกเอกลักษณ์ของโลหะทองแดง ศึกษาผลของปริมาณอนุภาคทองแดงขนาดนาโน (ปริมาณ 5, 10, 15, และ 20 เปอร์เซ็นต์โดยน้ำหนัก) ที่มีต่อสมบัติเชิงกล สมบัติทางความร้อน และการซึม ผ่านของก๊าซของฟิล์มนาโนคอมพอสิต การมีอยู่ของอนุภาคเบนโตไนด์และคอปเปอร์ขนาด นาโนเมตร ทำให้ฟิล์มนาโนคอมพอสิตมีการยึดตัวก่อนแตกหักเกินกว่า 300 เปอร์เซ็นต์ แต่ความ แข็งแรงต่อการดึงยึดลดลงไปประมาณ 27 เปอร์เซ็นต์ อนุภาคนาโนเมตรทำหน้าที่เสมือน เป็นสารก่อผลึก ทำให้เกิดการเพิ่มขึ้นของผลึกของฟิล์มพอลิพรอไพลีน การซึมผ่านของไอน้ำและ ก๊าซออกซิเจนมีค่าเพิ่มขึ้นไปตามปริมาณของคอปเปอร์ขนาดนาโนเมตรที่ใช้ ทั้งนี้ฟิล์มพอลิพรอพิ ลีนนาโนคอมพอสิตที่เตรียมได้สามารถนำไปใช้เป็นบรรจุภัณฑ์สำหรับการห่อหุ้มพลาสติกแช่เย็น

ABSTRACT

5372021063: Polymer Science Program
Pitchaya Naneraksa: Smart Packaging from Plastic/nanocopper
Nanocomposite.
Thesis Advisors: Assoc. Prof. Rathanawan Magaraphan 134 pp.
Keywords: Nanocomposite/ Copper nanoparticle/ Bentonite organoclay

This study is aimed to develop a smart packaging film from polypropylene blown film containing 1 wt% Bentonite organoclay/copper nanoparticles for barrier and antimicrobial purpose. Copper nanoparticles (CuNP) were synthesized using a one-step synthesis from copper (II) nitrate solution using ascorbic acid as reduction agent and polyvinylpyrrolidone as dispersant. The synthesized CuNPs had the particle size of about 6 nm, and the XRD spectrum confirmed three characteristic diffraction peaks of copper (0). Effect of CuNP content (5, 10, 15 and 20 wt% of total nano-fillers) on mechanical properties, thermal properties, and permeability of nanocomposite film was investigated. With the presence of OBEN/CuNP, PP nanocomposite films showed elongation at break in machine direction over 300% but their tensile strength was reduced for about 27 %. Nanoparticles acted as nucleating agents to increase crystallinity of PP films. Water vapour and oxygen permeability were increased with respect to the CuNP contents. PP nanocomposite films would be capable to be used in prepacked chilled fish packaging.

ACKNOWLEDGEMENTS

This work is financial supported by the Higher Education Research Promotion and National Research University Project of Thailand, Office of the Higher Education Commission (FW0649A). This thesis work is also partly funded by the Petroleum and Petrochemical College, and the Center of Excellence on Petrochemical and Materials Technology, Thailand. The authors are also grateful to the Department of Materials Science and Engineering, Silpakorn University for kindly support of machinery and instrument.

The author would like to gratefully thank her advisor, Assoc. Prof. Dr. Rathanawan Magaraphan, for her suggestion and valuable guidance throughout the work. Assist. Prof. Dr. Hathikarn Manuspiya and Dr. Orasa Onjun are appreciated for serving on her thesis committee. And, the author would like to thank the faculties of the Petroleum and Petrochemical College for their kindness and support during the study of her Master degree in Chulalongkorn University.

The author is greatly appreciated for her parents for their devoted love, support, and understanding during the hardship of the study and the research work. The author would like to give specially thank to Nion Sae-Lim, the senior colleague in the research group, for her kindly help performing SEM tests in urgent request. Last but not least, the author would like to thank all her PPC friends for their encouragement and fully support throughout the study in PPC.

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