

**SYNTHESIS AND DEPOSITION OF POLYANILINE AND SILVER
PARTICLES ON CELLULOSE FIBERS BY SOLUTION PLASMA PROCESS**

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Thesis Submitted in Partial Fulfilment 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

2015

I 28368642

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Thesis Title: Synthesis and Deposition of Polyaniline and Silver Particles
on Cellulose Fibers by Solution Plasma Process

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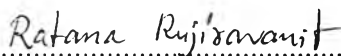
Program: Polymer Science


Thesis Advisors: Assoc. Prof. Ratana Rujiravanit
Prof. Nagahiro Saito


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

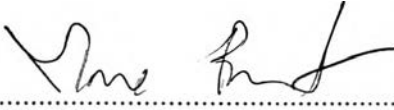

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ABSTRACT

5672016063: Polymer Science Program

Phanthitra Anantasattakul: Synthesis and Deposition of Polyaniline and Silver Particles on Cellulose Fibers by Solution Plasma Process.

Thesis Advisors: Assoc. Prof. Ratana Rujiravanit and Prof. Nagahiro Saito 94 pp.

Keywords: Polyaniline/ Cellulose fibers/ Silver particles/ Solution plasma process

Polyaniline is a fascinating conductive polymer due to its beneficial properties including high conductivity, high thermal stability and simple synthesis procedure. However, polyaniline has a drawback on its poor processability. Therefore, coating of polyaniline on cellulose fibers not only solves the problem on processability but also increases the flexibility and making it suitable for electronic device applications. Cellulose sheets were prepared from cellulose fibers by a paper-making process. Cellulose fibers from the inner core of banana tree were treated by solution plasma process in order to modify the surface for better interaction between cellulose fibers and polyaniline. Polyaniline was simultaneously polymerized and coated on cellulose fibers by applying solution plasma to enhance the deposition capability of polyaniline on cellulose fibers. In order to enhance the electrical conductivity, different amounts of silver particles were incorporated into the cellulose sheets. In addition to the effect of plasma treatment time on cellulose fibers, the effects of aniline to cellulose fibers ratios and plasma treatment time on coating of polyaniline and silver on cellulose fibers by solution plasma process were investigated. The as-prepared polyaniline and silver co-coated cellulose sheets were characterized by FTIR, SEM, bending test, XRD, electrical conductivity, XPS, TGA and water contact angle.

บทคัดย่อ

พันธิตรา อนันตะเศรษฐกุล : การสังเคราะห์และเคลือบพอลิอะนิลีนและอนุภาคเงินบนเส้นใยเซลลูโลสโดยใช้โซลูชันพลาสมา (Synthesis and Deposition of Polyaniline and Silver Particles on Cellulose Fibers by Solution Plasma Process) อาจารย์ที่ปรึกษา : รศ. ดร.รัตนา รุจิรวนิจ และ ศ. ดร. นากาฮิโร ไชโต 94 หน้า

พอลิอะนิลีนเป็นพอลิเมอร์ที่มีสมบัติการนำไฟฟ้าที่น่าสนใจเนื่องจากมันมีสมบัติที่ดี เช่น มีค่าการนำไฟฟ้าสูง ทนความร้อนได้สูงและสังเคราะห์ได้ง่าย อย่างไรก็ตามพอลิอะนิลีนยังคงมีข้อเสียคือมีชั้นรูปได้ยาก ดังนั้นการเคลือบพอลิอะนิลีนบนเส้นใยเซลลูโลสไม่เพียงแค่แก้ปัญหาในการขึ้นรูปอีกทั้งยังช่วยเพิ่มความยืดหยุ่นให้แก่พอลิอะนิลีน ซึ่งวิธีนี้ทำให้พอลิอะนิลีนสามารถนำไปใช้ในอุปกรณ์อิเล็กทรอนิกส์ได้ แผ่นเซลลูโลสที่ใช้ในงานวิจัยนี้เตรียมได้จากกระบวนการทำกระดาษ โดยเส้นใยเซลลูโลสที่ได้มาจากแกนต้นกล้วยถูกตัดแปลงโดยเทคนิคโซลูชันพลาสมาเพื่อที่จะปรับปรุงพื้นผิวให้เหมาะสมกับการเกิดปฏิกิริยาระหว่างเส้นใยเซลลูโลสและพอลิอะนิลีนให้ดีขึ้น พอลิอะนิลีนถูกสังเคราะห์และเคลือบบนเส้นใยเซลลูโลสพร้อมๆกันโดยการใช้โซลูชันพลาสมา ซึ่งการใช้โซลูชันพลาสมาสามารถช่วยในการยึดติดระหว่างพอลิอะนิลีนและเส้นใยเซลลูโลส และเพื่อเป็นการเพิ่มค่าการนำไฟฟ้าของพอลิอะนิลีนที่เคลือบบนแผ่นเซลลูโลสจึงได้เติมอนุภาคเงินลงไปปริมาณต่างๆ อีกทั้งในงานวิจัยนี้ได้ศึกษาผลของระยะเวลาในการพลาสมาต่อเส้นใยเซลลูโลส ผลของอัตราส่วนระหว่างเส้นใยเซลลูโลสและพอลิอะนิลีน และระยะเวลาในการพลาสมาในการเคลือบของพอลิอะนิลีนและอนุภาคเงินบนเส้นใยเซลลูโลส โดยพอลิอะนิลีนและอนุภาคเงินที่เคลือบบนเส้นใยเซลลูโลสถูกตรวจสอบโดยเครื่องฟลูอิดเรย์ทรานส์ฟอรั่ม อินฟราเรดสเปกโตรมิเตอร์ กล้องจุลทรรศน์อิเล็กตรอนแบบส่องกราด เครื่องทดสอบการงอ เครื่องวิเคราะห์การเลี้ยวเบนรังสีเอกซ์ เครื่องวัดค่าการนำไฟฟ้า เครื่องวิเคราะห์ผิววัสดุด้วยเทคนิค XPS เครื่องเทอร์โมกราวิเมตริก และเครื่องวิเคราะห์มุมติดต่อระหว่างน้ำและพื้นผิววัสดุ

ACKNOWLEDGEMENTS

First and foremost, I have to thank my supervisor Assoc.Prof. Ratana Rujiravanit. Without her assistance and dedicated involvement in every step throughout the process, this paper would have never been accomplished. I would like to thank you very much for your support and understanding.

I would also like to show gratitude to Prof. Anuvat Sirivat and Asst. Prof. Manisara Phiriyawirut for being thesis committee.

I am grateful for the scholarship and funding of the thesis work provided by the Petroleum and Petrochemical College and the Center of Excellence on Petrochemicals and Materials Technology, Thailand.

I would like to thank the staff members of The Petroleum and Petrochemical College for training instrument and giving the suggestion to me.

I am indebted to my many student colleagues to support a stimulating and fun environment to learn and grow. Particularly thanks are given to Chutima, Nattakamala and Chayanapat. Also, I simply say thanks to friends who made the two years such a memorable experience.

Most importantly, none of this could have happened without my family. They are always understanding, encouragement and supporting me throughout my life.

Lastly, I offer my regards and blessings to all of those who supported me in any respect during the completion of the project.

This research work was partially supported by the Ratchadapisek Sompoch Endowment Fund (2013), Chulalongkorn University (CU-56-900-FC) and Thailand Research Fund (IRG5780012).

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