

**CHITOSAN COATING ON A WOVEN PET SURFACE MODIFIED BY DBD
PLASMA TECHNIQUE FOR ANTIMICROBIAL PROPERTY
IMPROVEMENT**



Panee Sophonvachiraporn

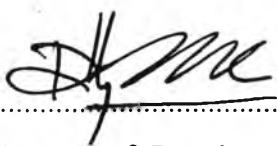
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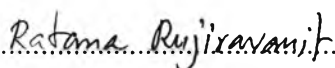
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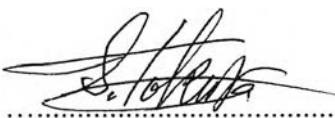
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By: Pannee Sophonvachiraporn
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Thesis Advisors: Assoc. Prof. Ratana Rujiravanit
Assoc. Prof. Sumaeth Chavadej
Dr. Thammanoon Sreethawong
Prof. Seiichi Tokura

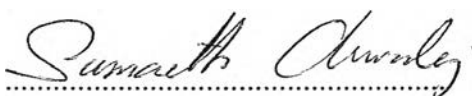
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Science.



..... Dean
(Asst. Prof. Pomthong Malakul)

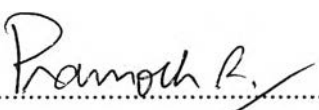
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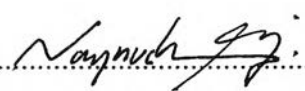

.....
(Assoc. Prof. Ratana Rujiravanit)


.....
(Prof. Seiichi Tokura)


.....
(Assoc. Prof. Sumaeth Chavadej)


.....
(Dr. Thammanoon Sreethawong)


.....
(Assoc. Prof. Pramoch Rangsunvigit)


.....
(Dr. Nongnuch Rueangjitt)

ABSTRACT

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Panee Sophonvachiraporn: Chitosan Coating on Woven PET Surface Modified by DBD Plasma Technique for Antimicrobial Property Improvement

Thesis Advisors: Assoc. Prof. Ratana Rujiravanit, Assoc. Prof. Sumaeth Chavadej, Dr. Thammanoon Sreethawong, and Prof. Seiichi Tokura pp.

Keywords: Dielectric Barrier Discharge/ Hydrophilicity/ Chitosan Coating/ Anti-microbial Property.

In this study, a woven PET fabric with antimicrobial property was prepared by coating the fabric's surface with chitosan. First, hydrophilic improvement of the woven PET surface was accomplished by plasma treatment using dielectric barrier discharge (DBD). The hydrophilicity of the woven PET surface was characterized by wickability measurements. The plasma-treated PET samples were further immersed in a chitosan acetate solution to achieve surface coating. The effects of chitosan concentration, temperature, and washing cycles on the amount of coated chitosan on the PET fabric were investigated. XPS analysis revealed an increment of polar functional groups, such as O=C-O⁻ and C-O⁻, on the PET surface after plasma treatment. However, the appearance of these functional groups decreased after surface coating with chitosan, indicating the involvement of these functional groups in an interaction with chitosan. The chitosan-coated woven PET fabric exhibited antimicrobial activity against *E. coli* and *S. aureus*.

บทคัดย่อ

พรรณิ โสภณวชิราพร : การเคลือบไคโตซานบนพื้นผิวของผ้าโพลีเอทิลีนทาบตาเลทที่ถูกเปลี่ยนแปลงด้วยเทคนิคพลาสมาแบบไดอิเล็กทริกแบริเออร์ดีสซาร์จ เพื่อเพิ่มคุณสมบัติการป้องกันแบคทีเรีย (Chitosan Coating on Woven PET Surface Modified by DBD Plasma Technique for Antimicrobial Property Improvement) อ.ที่ปรึกษา: รศ. ดร.รัตนารุจิรวนิช, รศ. ดร.สุเมธ ชวเดช, ดร.ธรรมบุญ ศรีทะวงศ์, และ ศ.ดร.เชอิจิ โทคุระ, 77 หน้า

งานวิจัยนี้เป็นการศึกษาปรับปรุงเปลี่ยนแปลงพื้นผิวของผ้าโพลีเอทิลีนทาบตาเลท เพื่อเพิ่มคุณสมบัติในการยับยั้งแบคทีเรียโดยการเคลือบไคโตซานบนพื้นผิวของผ้า โดยทำการเปลี่ยนแปลงโครงสร้างพื้นผิวของผ้าโพลีเอทิลีนทาบตาเลทเพื่อให้มีคุณสมบัติในการดูดซับน้ำ ภายใต้สภาวะพลาสมาแบบไดอิเล็กทริกแบริเออร์ดีสซาร์จ และทำการตรวจสอบคุณสมบัติด้วยวิธีการดูดซับน้ำ (wickability measurement) หลังจากการเปลี่ยนแปลงโครงสร้างของผ้าโพลีเอทิลีนทาบตาเลทให้มีคุณสมบัติการดูดซับน้ำเพิ่มขึ้นแล้ว ได้ทำการเคลือบไคโตซานโดยจุ่มผ้าโพลีเอทิลีนทาบตาเลทลงในสารละลายไคโตซานอะซีเตท ซึ่งทำการศึกษาผลกระทบของความเข้มข้นของไคโตซาน, อุณหภูมิ, และจำนวนรอบในการซักล้างที่มีผลต่อปริมาณของไคโตซานที่อยู่บนพื้นผิวของผ้าโพลีเอทิลีนทาบตาเลท จากการตรวจสอบด้วยเทคนิค X-ray photoelectron spectroscopy (XPS) พบว่ามีหมู่ฟังก์ชัน $O=C-O$ และ $C-O$ บนพื้นผิวของผ้าโพลีเอทิลีนทาบตาเลทเกิดขึ้น อย่างไรก็ตามพบว่าหมู่ฟังก์ชันเหล่านี้ได้ลดลงหลังจากการเคลือบพื้นผิวของผ้าโพลีเอทิลีนทาบตาเลทด้วยไคโตซาน ซึ่งแสดงว่าหมู่ฟังก์ชันเหล่านี้ได้ทำปฏิกิริยากับไคโตซาน จากผลการทดสอบการป้องกันแบคทีเรียพบว่าผ้าโพลีเอทิลีนทาบตาเลทที่ผ่านการเปลี่ยนแปลงโครงสร้างด้วยพลาสมาและเคลือบด้วยไคโตซานแล้วมีประสิทธิภาพในการยับยั้งแบคทีเรียชนิด *Escherichia coli* และ *Staphylococcus aureus* ได้ดีมาก

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