

**PREPARATION OF NYLON-CHITIN MEMBRANES BY SOLUTION
CASTING AND COATING VIA DBD PLASMA TREATMENT FOR WOUND
CARE APPLICATIONS**

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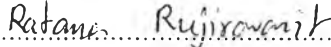
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Thesis Advisor: Assoc. Prof. Ratana Rujiravanit

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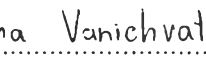

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ABSTRACT

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To enhance the interaction between nylon and chitin, dielectric barrier discharge plasma (DBD) was applied to treat nylon/chitin membranes fabricated by two different ways which were solution casting and surface coating. For solution casting method, chitin and nylon 6,6 is separately dissolved in calcium chloride-saturated methanol solvent before mixing together at different mixings ratios. The membranes were casting in a glass mould to form nylon/chitin membranes and drying in air and then washing with distilled water to remove the calcium salt, drying in oven and membranes and finally followed by subjecting the membranes to DBD treatment at various plasma treatment times of 0s, 30s, 60s, 90 and 120s. For surface coating method, chitin dissolved in calcium chloride-saturated methanol was coated on DBD plasma-treated nylon mesh. The concentrations of chitin were varied to be 0.5%, 1%, and 2% and compare two different ways. The effects of the blend ratio, plasma treatment time and chitin concentrations on morphology, chemical structure, and mechanical properties were investigated by SEM, FTIR, water contact angle, and Lloyd tensile tester, respectively. In addition, biocompatibility test by cytotoxic method using human dermal skin fibroblast. The results show decrement of tensile strength, elongation at break and contact angle when treatment times increase, after treated plasma by using FT-IR investigation that generates new peak at $1,720\text{ cm}^{-1}$ which corresponds to carbonyl group (C=O) and finally biocompatible cell proliferation of human skin fibroblast is growing on nylon-chitin surface.

บทคัดย่อ

กุลชาติ โอชาว่า : การเตรียมแผ่นไนลอน-ไคตินจากการขึ้นรูปโดยวิธีสารละลายที่ผ่านกระบวนการเทคนิคพลาสมาแบบไดอิเล็กทริกแบริเออร์ดีสชาร์จสำหรับการประยุกต์รักษาบาดแผล (Preparation of Nylon/Chitin Membranes by Solution Casting and Coating via DBD Plasma Treatment for Wound Care Applications) อาจารย์ที่ปรึกษา : รศ. ดร. รัตนา รุจิรวนิช 69 หน้า

เพื่อปรับปรุงแรงยึดเหนี่ยวของไคตินบนผิวไนลอน โดยการผ่านกระบวนการเทคนิคพลาสมาแบบไดอิเล็กทริกแบริเออร์ดีสชาร์จ ซึ่งมีกรรมวิธีการเตรียมอยู่ 2 แบบ ได้แก่ วิธีขึ้นรูปโดยสารละลายและวิธีการเคลือบผิว ซึ่งวิธีขึ้นรูปโดยสารละลายจะนำไนลอน 6,6 มาละลายในสารละลายแคลเซียมคลอไรด์-เมทานอลที่อิ่มตัวโดยใช้ปริมาณสัดส่วนไคตินที่ต่างกัน และขึ้นรูปเป็นแผ่นเมมเบรนโดยใช้กระจกนาฬิกาและนำไปผ่านกระบวนการพลาสมาในเวลาที่ต่างกัน ได้แก่ 0 วินาที, 30 วินาที, 60 วินาที, 90 วินาที และ 120 วินาที สำหรับวิธีการเคลือบผิว จะนำสารละลายไคตินมาเคลือบบนผิวของผ้าไนลอนโดยใช้การพลาสมา ซึ่งสารละลายไคตินเตรียมได้จากนำไคตินมาละลายในสารละลายแคลเซียมคลอไรด์-เมทานอลที่อิ่มตัว ในเข้มข้นต่างๆที่ 0.5%, 1.0% และ 2.0% ซึ่งผลของ สัดส่วนการผสม, เวลาในการใช้พลาสมา, ปริมาณไคตินบนผิว, โครงสร้างทางเคมี และคุณสมบัติทางกล ของการเตรียมทั้งสองวิธี โดยใช้ เครื่องทดสอบทางกล, กล้องจุลทรรศน์อิเล็กตรอนแบบสแกน, การใช้หยดน้ำเพื่อสังเกตมุมสัมผัส การใช้ลำแสงฟูเลียร์ทรานฟอร์ม และความเป็นพิษของสารทดสอบต่อเซลล์จากกระบวนการไซโตทอกซิกโดยใช้เซลล์ผิวหนังมนุษย์ จากผลการทดลองพบว่า ความแข็งแรงทางกลทั้งความตึง-ความเครียด และ มุมสัมผัสของหยดน้ำ ลดลงเมื่อเวลาการใช้พลาสมานานขึ้น และหลังการผ่านพลาสมา จะเกิดพีคใหม่ที่ 1,720 cm^{-1} ซึ่งบ่งบอกถึงหมู่คาร์บอนิล ($\text{C}=\text{O}$) และสุดท้ายการทดสอบทางไบโอพบว่าเซลล์ผิวหนังมนุษย์เจริญเติบโตขึ้นบนผิวไนลอน-ไคติน

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