

**DYE ADSORPTION AND DESORPTION CHARACTERISTICS OF  
CM-CHITIN/CHITIN WHISKER BIONANOCOMPOSITE FILMS**



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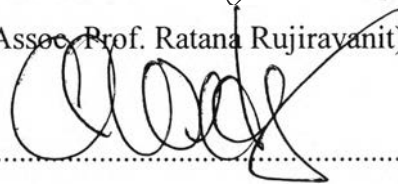
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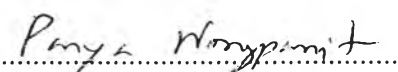
  
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## ABSTRACT

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Carboxymethyl chitin (CM-chitin)/chitin whisker (CTW) bionanocomposite films were fabricated by solution casting technique. Glyoxal was used as a crosslinking agent for retaining shape of the films in wet state. The effects of crosslinking concentrations on physical properties of the films were evaluated in terms of swelling behaviour and weight loss. Methylene blue, a cationic dye and methylorange, an anionic dye, were selected as model compounds in order to examine the adsorption and desorption characteristics of the films. The effects of solvent of dye, blend composition and types of dye on the dye adsorption of the films were investigated as a function of adsorption time. The CM-chitin film crosslinking with glyoxal could form hydrogel in wet state and had high degree of swelling with low percentage of weight loss. The presence of CTW in the crosslinked CM-chitin films resulted in the improvement in shape stability. Furthermore, CM-chitin films had higher adsorption capacities for the methylene blue than methyl orange because of the interaction between carboxymethyl group and cationic group of the dye. The existence of chitin whisker in composite films exhibited the lower adsorption and desorption due to the low degree of swelling.

## บทคัดย่อ

ครุณี ไศภณัฐยานนท์ : การเตรียมและวิเคราะห์ลักษณะการดูดซับและคายซับสีของฟิล์มคอมโพสิตระหว่างคาร์บอกซีเมทิลไคตินและเส้นใยไคตินระดับนาโน (Dye Adsorption and Desorption Characteristics of CM-chitin/Chitin Whisker Bionanocomposite Films) อ. ที่ปรึกษา : รศ. ดร. รัตนา รุจิรวนิช และ ศ. ดร. คริสโตฟท์ เวเคอร์ 128 หน้า

ปัจจุบันวัสดุไบโอนาโนคอมโพสิตได้รับความนิยมในการนำมาทำอุปกรณ์ทางเวชภัณฑ์ซึ่งในกระบวนการรักษาทางแพทย์นั้น วัสดุปิดแผลถือเป็นหนึ่งในอุปกรณ์สำคัญที่ช่วยเพิ่มประสิทธิภาพในการรักษาแผล ในงานวิจัยนี้คาร์บอกซีเมทิลไคตินและเส้นใยไคตินระดับนาโนถูกเลือกมาศึกษาทำเป็นฟิล์มปิดแผลที่มีการใส่สารประกอบเพื่อช่วยรักษาแผลโดยใช้สารสีเป็นตัวแทนของการศึกษา คาร์บอกซีเมทิลไคตินเป็นอนุพันธ์หนึ่งของไคตินที่สามารถละลายน้ำได้และสามารถเกิดลักษณะไฮโดรเจลได้โดยการเชื่อมขวาง ซึ่งงานวิจัยเลือกใช้ไกลออกซอล (glyoxal) เป็นสารเชื่อมขวาง ผลการศึกษาพบว่า การใส่เส้นใยไคตินระดับนาโนลงไปวัสดุทำให้ความสามารถในการบวมตัวในน้ำลดลง และมีน้ำหนักที่สูญเสียไปกับน้ำน้อยลง ซึ่งถือเป็นการปรับปรุงความเสถียรทางรูปร่างของฟิล์มในสภาวะเปียก นอกจากนี้ฟิล์มคอมโพสิตระหว่างคาร์บอกซีเมทิลไคตินและเส้นใยไคตินระดับนาโนยังถูกศึกษาลักษณะการดูดซับและคายซับของสีสองชนิด คือสีที่มีประจุบวกและประจุลบ คาร์บอกซีเมทิลไคตินซึ่งมีประจุลบที่บริเวณหมู่คาร์บอกซีเมทิลสามารถดูดซับสีที่มีประจุบวกได้ดีกว่าสีที่มีประจุลบ เนื่องจากมีแรงดึงดูดระหว่างไอออน ส่วนผลการคายซับพบว่าฟิล์มคอมโพสิตที่มีส่วนประกอบของเส้นใยไคตินระดับนาโนหลายๆจะมีความสามารถในการคายซับลดลงเนื่องจากสามารถบวมตัวในน้ำได้น้อยลง นอกจากนี้การมีเอนไซม์ไลโซไซม์ (Lysozyme) ในระบบจะช่วยทำให้ฟิล์มคอมโพสิตสามารถคายซับสีออกมาได้มากขึ้น

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