

**PREPARATION AND CHARACTERIZATION OF HYDROGELS BASED
ON 2-ACRYLAMIDO-2-METHYLPROPANE SULFONIC ACID SODIUM
SALT AND/OR CHITIN WHISKERS FOR BIOMEDICAL APPLICATIONS**

Pimpa Suwanpreuksa

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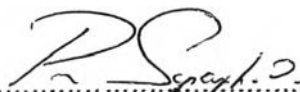
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By: Pimpa Suwanpreuksa
Program: Polymer Science
Thesis Advisor: Prof. Pitt Supaphol


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University, in partial fulfilment of the requirements for the Degree of Master of
Science.


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

Thesis Committee:


.....
(Prof. Pitt Supaphol)


.....
(Asst. Prof. Hathaikarn Manuspiya)


.....
(Dr. Angkana Tanvatanagul)

ABSTRACT

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The main objective of this study was to prepare synthetic hydrogels for biomedical application as wound dressings. The hydrogels of 2-acrylamido-2-methylpropane sulfonic acid sodium salt (AMPS- Na^+) were prepared by free-radical polymerization in aqueous solution using Gamma radiation and Ultraviolet radiation method in the presence of *N,N'*-methylenebis(acrylamide) (MBA) as a crosslinker. In this work studied the effect of different percentages of crosslinker from 0.1 to 1% mol and various monomer concentrations from 30 to 50% (w/v) which used to prepared hydrogels with different crosslink densities. 0.01% (w/w) of hydroxycyclohexyl phynyl ketone was used as a photoinitiator for Ultraviolet radiation technique. The results showed that hydrogels from 30% (w/v) AMPS- Na^+ with 0.1%MBA was glutinous and did not stay in the sheet form while hydrogels from 50% (w/v) AMPS- Na^+ had less flexibility and easy to lacerate. Chitin whisker, prepared from acid hydrolysis of chitin flake, was incorporated into AMPS- Na^+ hydrogels to improve dimensional stability and enhance their mechanical properties. Chitin whisker contents in AMPS- Na^+ hydrogels were varied from 3 to 8% (w/w). AMPS- Na^+ hydrogels were transparent whereas the chitin whisker reinforced AMPS- Na^+ hydrogels became more translucent as the contents of chitin whiskers increased. By addition of chitin whisker, hydrogels had better mechanical properties than those neat hydrogels, the tensile strength and percentage of elongation were higher than that of neat AMPS- Na^+ hydrogels. The cytotoxicity of hydrogels was determined by indirect method using MTT assay and L929 mouse fibroblasts cultured. The hydrogels were non-toxic with L929 fibroblasts.

บทคัดย่อ

พิมพ์ สุวรรณพุกษา : การเตรียมและศึกษาสมบัติของไฮโดรเจลจากเกลือโซเดียมของ 2-Acrylamido-2-Methylpropane Sulfonic Acid และ เสริมแรงด้วยไคตินวิสเกอร์สำหรับใช้ในทางการแพทย์ (Preparation and Characterization of Hydrogel based on 2-Acrylamido-2-Methylpropane Sulfonic Acid Sodium Salt and/or Chitin Whiskers for Biomedical Application) อ. ที่ปรึกษา : ศ. ดร. พิชญ์ สุภผล 98 หน้า

วัตถุประสงค์หลักของงานวิจัยนี้คือการเตรียมไฮโดรเจลสังเคราะห์สำหรับการใช้ในการแพทย์เป็นวัสดุปิดแผล ไฮโดรเจลจากเกลือโซเดียมของ 2-acrylamido-2-methylpropane sulfonic acid (AMPS-Na⁺) เตรียมได้จากขบวนการพอลิเมอไรเซชันแบบพรีเรดิคัลในตัวกลางที่เป็นน้ำโดยอาศัยรังสีแกมมาและรังสีอุลตราไวโอเล็ต โดยใช้ *N,N'*-methylenebis(acrylamide) (MBA) เป็นตัวเชื่อมต่อสายโซ่ ในงานวิจัยได้ทำการศึกษาถึงอิทธิพลของตัวเชื่อมต่อสายโซ่ในช่วงของ 0.1-1%mol และความเข้มข้นของสารละลายมอนอเมอร์ 30-50% (w/v) และใช้ 0.01% ของ hydroxycyclohexyl phenyl ketone เป็นตัวริเริ่มปฏิกิริยาดัวยรังสีอุลตราไวโอเล็ต จากการศึกษาพบว่าไฮโดรเจลที่มีความเข้มข้นของมอนอเมอร์ 30% และเปอร์เซ็นต์ของตัวเชื่อมต่อสายโซ่เท่ากับ 0.1 จะมีความเหนียวและไม่สามารถคงรูปเป็นแผ่นได้ ในขณะที่ไฮโดรเจลที่มีความเข้มข้นของมอนอเมอร์ 50% มีความยืดหยุ่นลดลงและฉีกขาดง่าย งานวิจัยนี้ได้นำไคตินวิสเกอร์ซึ่งเตรียมได้จากปฏิกิริยาการย่อยสลายด้วยกรดของไคตินมาผสมกับสารละลาย AMPS-Na⁺ เพื่อช่วยให้ไฮโดรเจลมีความคงรูปมากขึ้น และเพิ่มสมบัติเชิงกลของไฮโดรเจล โดยนำมาผสมในปริมาณ 3-8% (w/v) ลักษณะภายนอกของไฮโดรเจลจากที่มีความใสจะมีความขุ่นเพิ่มมากขึ้นตามปริมาณของไคตินวิสเกอร์ที่ผสมลงไป และไฮโดรเจลที่เสริมแรงด้วยไคตินวิสเกอร์มีความแข็งแรงทางเชิงกลเพิ่มมากขึ้น การทดสอบความเป็นพิษของไฮโดรเจลต่อเซลล์ไฟโบบลาสโดยวิธีเอ็มทีทีพบว่าไฮโดรเจลที่เตรียมได้ไม่มีความเป็นพิษต่อเซลล์

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