

**CONTROLLED RELEASE OF SULFOSALICYLIC ACID FROM
POLY(VINYL ALCOHOL) HYDROGEL BY ELECTRICAL STIMULATION**

Kanokporn Juntanon

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By: Kanokporn Juntanon
Program: Polymer Science
Thesis Advisors: Assoc. Prof. Anuvat Sirivat

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..... *Nantaya Yanumet* College Director
(Assoc. Prof. Nantaya Yanumet)

Thesis Committee:

..... *Anuvat Sirivat*
(Assoc. Prof. Anuvat Sirivat)

..... *Sujitra Wongkasemjit*
(Assoc. Prof. Sujitra Wongkasemjit)

..... *Ratana Rujiravanit*
(Asst. Prof. Ratana Rujiravanit)

ABSTRACT

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This study evaluated and characterized the use of poly (vinyl alcohol) (PVA) hydrogels as the matrix/carriers for a drug in the Electrically Controlled Drug Delivery System. The drug-loaded PVA hydrogels were prepared by solution-casting using sulfosalicylic acid as the model drug and glutaraldehyde as the crosslinking agent. The average molecular weight between crosslinks, crosslinking density, and mesh size of the PVA hydrogels were determined using the Equilibrium Swelling Theory developed by Peppas and Merrill, as well as by scanning electron microscopy (SEM). The release mechanisms and the diffusion coefficients of the hydrogels were studied using a modified Franz-Diffusion cell in an acetate buffer at pH 5.5 and at a temperature of 37 °C for 48 hours, in order to determine the effects of crosslinking ratio, electric field strength and electrode polarity. The amount of released drug was analyzed by UV-Visible spectrophotometry. The plots of the amount of drug released as a function of square root of time showed a linear relationship. The diffusion coefficients of drug in PVA hydrogels decreased with increasing crosslinking ratio. Moreover, the diffusion coefficients of drug in the PVA hydrogels depended critically on the electric field strength between 0-5 V and the electrode polarity.

บทคัดย่อ

กนกพร จันทนนท์ : การควบคุมการปลดปล่อยซัลโฟซาลิซิลิกแอซิดจากพอลิไวนิลอัลกอฮอล์ไฮโดรเจลโดยการกระตุ้นด้วยกระแสไฟฟ้า (Controlled Release of Sulfosalicylic Acid from Poly(vinyl alcohol) Hydrogel by Electrical Stimulation) อ.ที่ปรึกษา: รศ.ดร. อนุวัฒน์ ศิริวัฒน์ 115 หน้า

ในงานวิจัยฉบับนี้ได้ทำการศึกษาการใช้พอลิไวนิลอัลกอฮอล์ไฮโดรเจลเป็นตัวส่งผ่านยาในระบบการควบคุมการปลดปล่อยยาด้วยกระแสไฟฟ้า พอลิไวนิลอัลกอฮอล์ไฮโดรเจลผสมด้วยยาได้เตรียมโดยวิธีการเตรียมเป็นแผ่นด้วยสารละลายระหว่างซัลโฟซาลิซิลิกแอซิดแทนโมเดลยาและ กลูตาไรต์ไฮโดรเจนซัลเฟตเป็นสารเชื่อมโยง น้ำหนักโมเลกุลระหว่างตัวเชื่อมโยง ความหนาแน่นของตัวเชื่อมโยง และขนาดช่องว่างภายในพอลิไวนิลอัลกอฮอล์ไฮโดรเจล ได้คำนวณจากทฤษฎีการดูดซับน้ำของเปปไทด์และเมอร์ลและตรวจสอบด้วยเครื่องจุลทรรศน์อิเล็กตรอนแบบส่องกราด กลไกการปลดปล่อยและค่าการแพร่ของยาผ่านไฮโดรเจลนี้ได้ศึกษาโดยใช้ modified Franz-Diffusion cell ในสารละลายบัฟเฟอร์ที่พีเอช 5.5 อุณหภูมิ 37 องศาเซลเซียส เป็นเวลา 48 ชั่วโมง โดยทำการศึกษาผลของปริมาณสารเชื่อมโยง ความเข้มของกระแสไฟฟ้า และ ความเป็นขั้วของขั้วไฟฟ้า ปริมาณยาที่ถูกปลดปล่อยได้ทำการวิเคราะห์ด้วยเครื่องยูวี-วิซิเบิลสเปกโตรโฟโตมิเตอร์ และจากการศึกษาพบว่า กราฟความสัมพันธ์ระหว่างปริมาณยาที่ถูกปลดปล่อยและเวลาที่สองของเวลาในการปลดปล่อยยา แสดงความสัมพันธ์เป็นเส้นตรง และค่าการแพร่ของยาผ่านไฮโดรเจลลดลงเมื่อเพิ่มปริมาณสารเชื่อมโยง นอกจากนี้ความเข้มของกระแสไฟฟ้า และความเป็นขั้วของขั้วไฟฟ้า มีผลต่อค่าการแพร่ของยาผ่านไฮโดรเจลอีกด้วย

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