

**SOLUTION PLASMA PROCESS FOR DEACETYLATION AND
DEPOLYMERIZATION OF CHITIN HYDROGEL**

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ABSTRACT

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In this study, solution plasma process (SPP), a plasma generated in a liquid phase, was applied in depolymerization and deacetylation reactions of chitin hydrogel to form chitosan. Chitin hydrogel, an amorphous form of chitin, was depolymerized by SPP in 1% acetic acid solution for 0 h, 3 h, and 5 h in order to reduce its molecular weight before being subjected to deacetylation reaction to form chitosan. The effect of depolymerization prior to deacetylation on the degree of deacetylation (DD) of the deacetylated products was examined. Deacetylation reaction was performed by applying SPP in different concentrations of KOH in MeOH. The concentrations of KOH in MeOH were varied to be 0%, 7%, and 10%. Deacetylation reaction via SPP was done repeatedly up to 5 cycles (one hour for each cycle to achieve the highest values of %DD). The effects of KOH concentration and plasma treatment time on %DD, molecular weight, chemical structure, and crystallinity of the deacetylated products were investigated by FTIR, GPC, and XRD. The results showed that %DD determined by FTIR increased with an increasing of the KOH concentration and plasma treatment time. In addition, the depolymerization of chitin hydrogel prior to deacetylation resulted in the higher values of %DD and %solubility of the deacetylated products.

บทคัดย่อ

กุนทีณี สมบูรณ์ยิ่ง : กระบวนการดีพอลิเมอร์ไรเซชันและดีอะเซทิลเลชันไคตินไฮโดรเจลด้วยเทคนิคพลาสมาในสารละลาย (Solution Plasma Process for Deacetylation and Depolymerization of Chitin Hydrogel) อ. ที่ปรึกษา รศ. ดร. รัตนา รุจิรวนิช ศ. ดร. นากาฮิโร ไชโต จำนวน 93 หน้า

เทคนิคโซลูชันพลาสมาเป็นเทคนิคการกำเนิดพลาสมาในสารละลาย ซึ่งในงานวิจัยนี้ได้ใช้เทคนิคนำโซลูชันพลาสมาใช้ในการเกิดกระบวนการดีพอลิเมอร์ไรเซชันและดีอะเซทิลเลชันกับไคตินไฮโดรเจลเพื่อให้ได้ไคโตซาน ไคตินไฮโดรเจลเป็นไคตินอยู่ในรูปแบบของเจลที่ไม่มีความเป็นผลึกได้นำมาผ่านปฏิกิริยาดีพอลิเมอร์ไรเซชันในกรดแอสติกที่มีความเข้มข้น 1% โดยเทคนิคโซลูชันพลาสมาและเปรียบเทียบอัตราการเกิดปฏิกิริยาที่เวลา 0, 3 และ 5 ชั่วโมง เพื่อดูผลของการลดลงของน้ำหนักโมเลกุลก่อนการเกิดปฏิกิริยาดีอะเซทิลเลชัน นอกจากนี้ยังทำการศึกษาผลการเกิดปฏิกิริยาดีพอลิเมอร์ไรเซชันต่อการเพิ่มของค่าเปอร์เซ็นต์ดีดีหรือ degree of deacetylation ในส่วนกระบวนการดีอะเซทิลเลชันนั้นทำการศึกษาผลกระทบของความเข้มข้นที่ 0% 7% และ 10% ของสารละลายเบสต่อการเพิ่มของ เปอร์เซ็นต์ดีดีน้ำหนักโมเลกุล โครงสร้างทางเคมีและความเป็นผลึกของสารละลายโดยใช้เครื่องมือ FTIR, GPC และ XRD ในการศึกษา จากผลการทดลองพบว่าเมื่อเพิ่มความเข้มข้นของสารละลายเบสและจำนวนรอบในการทำปฏิกิริยาดีอะเซทิลเลชันส่งผลให้ค่าเปอร์เซ็นต์ดีดีเพิ่มขึ้น นอกจากนี้การทำปฏิกิริยาดีพอลิเมอร์ไรเซชันในไคตินไฮโดรเจลก่อนนำไปทำปฏิกิริยาดีอะเซทิลเลชันให้ค่าเปอร์เซ็นต์ดีดีและค่าการละลายที่มากกว่าผลิตภัณฑ์ที่มาจากกระบวนการดีอะเซทิลเลชันเพียงอย่างเดียว

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