

**DEACETYLATION OF CHITIN HYDROGEL
BY USING SOLUTION PLASMA**

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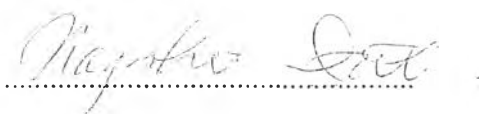


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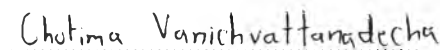
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ABSTRACT

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Deacetylation is a chemical reaction used for converting chitin into chitosan. Since native chitin has low reactivity to the deacetylation reaction, chitin hydrogel, an amorphous form of chitin, was applied in this study. Chitin hydrogel was prepared by dissolving native chitin in a calcium chloride-saturated methanol solution and subsequently precipitating in a large amount of water. Solution plasma was introduced to the deacetylation reaction of chitin in order to reduce the NaOH concentration required in the reaction. In the solution plasma system, several highly active species such as hydroxyl radicals, hydroperoxyl radicals, and free electrons were generated. These highly active species might help to facilitate the deacetylation reaction of chitin, which resulted in using a lower concentration of NaOH solution. The deacetylation reaction of chitin hydrogel was carried out by varying concentrations of NaOH in alcohol solutions to 1%, 5%, 10%, and 12%. By using solution plasma, the degree of deacetylation of the chitin hydrogel increased with increasing NaOH concentration as well as the plasma treatment time. The chemical structure and degree of deacetylation of the products were determined by FTIR and NMR. The molecular weight and molecular weight distribution of the obtained chitosan were investigated by GPC. Moreover, the antimicrobial activity of chitosan obtained from solution plasma method was also evaluated against *E. coli* and *S. aureus*.

บทคัดย่อ

มณีกาญจน์ กันตะคะนันท์ : กระบวนการดื้ออะเซทิลเลชันไคตินไฮโดรเจลด้วยเทคนิคพลาสมาในสารละลาย (Deacetylation of Chitin Hydrogel by Using Solution Plasma) อ. ที่ปรึกษา : รศ. ดร. รัตนา รุจิรวนิช และ ศ. ดร. นากาฮิโร ไชโต 93 หน้า

กระบวนการดื้ออะเซทิลเลชันคือปฏิกิริยาทางเคมีที่ใช้ในการเปลี่ยนไคตินให้กลายเป็นไคโตซาน เนื่องจากไคตินมีสมบัติความเป็นผลึกสูงจึงส่งผลให้มีความว่องไวต่อปฏิกิริยาอะเซทิลเลชันต่ำ ในงานวิจัยจึงทำการเปลี่ยนไคตินให้กลายเป็นไคตินไฮโดรเจลทำให้ไคตินมีสมบัติผลึกลดลงส่งผลให้มีความว่องไวต่อปฏิกิริยาสูงขึ้น กระบวนการเตรียมไคตินไฮโดรเจลสามารถเตรียมได้จากนำไคตินไปละลายในสารละลายแคลเซียมคลอไรด์ในเมทานอล จากนั้นนำสารละลายไคตินที่ได้มาทำการตกตะกอนในน้ำกลั่นจำนวนมาก จะทำให้ได้ไคตินไฮโดรเจลเกิดขึ้น การใช้เทคนิคพลาสมาในสารละลายในกระบวนการดื้ออะเซทิลเลชันสามารถช่วยลดความเข้มข้นของสารละลายโซเดียมไฮดรอกไซด์ที่ใช้ในการเกิดปฏิกิริยาให้น้อยลงได้เมื่อเปรียบเทียบกับวิธีดั้งเดิมทั่วไป เนื่องจากเทคนิคพลาสมาในสารละลายสามารถทำให้เกิดสปีชีส์ที่ว่องไวต่อปฏิกิริยา เช่น ไฮดรอกซีแรดดิคัล, ไฮดรอกซีไอออน และ อิเล็กตรอนอิสระ เป็นต้น ซึ่งสปีชีส์ที่มีความว่องไวต่อปฏิกิริยาสูงเหล่านี้สามารถทำให้เกิดกระบวนการดื้ออะเซทิลเลชันได้ดีขึ้นส่งผลให้ปริมาณความเข้มข้นของสารละลายโซเดียมไฮดรอกไซด์ที่ใช้ลดลง ในการทดลองได้ทำการเตรียมกระบวนการดื้ออะเซทิลเลชันของไคตินไฮโดรเจลด้วยเทคนิคพลาสมาในสารละลายจากสารละลายโซเดียมไฮดรอกไซด์ที่มีความเข้มข้น 1%, 5% ,10% และ 12%. จากผลการทดลองพบว่าการใช้เทคนิคพลาสมาในสารละลายในกระบวนการดื้ออะเซทิลเลชันของไคตินไฮโดรเจลสามารถเพิ่มเปอร์เซ็นต์ดื้ออะเซทิลเลชันของไคตินไฮโดรเจลให้สูงขึ้นตามความเข้มข้นของสารละลายโซเดียมไฮดรอกไซด์ที่สูงขึ้น ซึ่งโครงสร้างทางเคมีของไคตินไฮโดรเจลหลังผ่านกระบวนการพลาสมาได้ทำการตรวจสอบจาก FTIR และ NMR ไคตินไฮโดรเจลหลังผ่านกระบวนการพลาสมาจะมีน้ำหนักโมเลกุลลดลงเมื่อปฏิกิริยาดำเนินไป และมีความสามารถในการละลายในกรดอะซิติกสูงขึ้น นอกจากนี้ไคโตซานไฮโดรเจลที่ได้ยังมีฤทธิ์ในการต้านทานแบคทีเรียดีขึ้นอีกด้วย

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