

الآية

قال تعالى:

{قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ

أَنْتَ الْعَلِيمُ الْحَكِيمُ }

صدق الله العظيم

سورة البقرة (الآية 32)

Dedication

To the soul of my father

To my mother, brothers, and sisters

Acknowledgement

Above all, I would like to Almighty Allah for help to finalize this thesis. I would like to express my sincere gratitude to my supervisor, Dr. Adil Elhag Ahmed for his guidance, enthusiasm, encouragement, support and inspiring knowledge in this work. I would also like to convey my appreciation to my research group mates and friends for their technical support; I really appreciate their companionship and support. Last but not least, I would like to thanks my beloved family members who have always stood by me and encouraged me throughout the course of my study.

Abstract

This research project aims to utilize cotton fuzz for the synthesis of carboxymethylcellulose (CMC). Cellulose was isolated from wasteful cotton fuzz with sodium hydroxide (NaOH), and then converted to commercially valuable CMC material by etherification reaction using monochloroacetic acid (MCAA) as etherifying agent, in the presence of NaOH. Many conditions that influence the course of the conventional etherification reaction were kept constant. These conditions were the weight of cellulose (5g), weight of MCAA (5g), and the reaction temperature (55 C). However, the solvent (isopropanol) was replaced with a cheaper and less hazardous one (ethanol). In addition various amounts of sodium chloride (NaCl) were introduced to the reaction mixture to study its effect in the degree of substitution (DS). The optimum amount of NaCl needed to produce CMC of high DS value (0.845) was found to be 10 g. The synthesized CMC material was characterized by FT-IR and it was found to be comparable to the commercial CMC materials. This study clearly showed that the biomass cotton fuzz is promising source of cellulose for the production of, commercially, valuable CMC material with high DS value.

مستخلص البحث

هدفت هذه الدراسة إلى استخدام زغب القطن لتخليق مادة كاربوكسي ميثيل السيليلوز. عزل السيليلوز من متبقى القطن بواسطة هيدروكسيد الصوديوم ومن ثم تم تحويله إلى مادة كاربوكسي ميثيل سيليلوز ذات القيمة التجارية بواسطة تفاعل الأثيره باستخدام مادة حمض الخليك أحادي الكلور كعامل أثيرة فى وجود هيدروكسيد الصوديوم. ضبطت بعض الظروف المؤثرة على التفاعل مثل وزن حمض الخليك أحادي الكلور و المذيب ودرجة الحرارة. وقد تم إستبدال مذيب الأيسوبربانول بالإيثانول الأكثر أمناً والأقل تكلفه. بالإضافة لذلك تم إضافة مقادير مختلفه من ملح كلوريد الصوديوم لدراسة تأثيرها على زيادة درجة الإستبدال. وجد أن الوزن المثالي من ملح كلوريد الصوديوم المضاف اللازم للحصول على أعلى درجة إستبدال (0.845) هو 10 جرام. شخصل مادة كاربوكسي ميثيل السيليلوز المصنعه بواسطة جهاز مطيافية الأشعه تحت الحمراء و وجد أنها تماثل مادة كاربوكسي ميثيل السيليلوز التجارية. هذه الدراسة توضح إمكانية استخدام زغب القطن كمصدر وفير للسيليلوز لإستخدامه لتحضير مادة كاربوكسي ميثيل السيليلوز.

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List of abbreviations

Abbreviations	Full name
CMC	Carboxymethylcellulose
DS	Degree of Substitution
MCAA	Monochloroacetic acid
FT-IR	Fourier transform infrared
H-CMC	Acid Carboxymethylcellulose
Na-CMC	Sodium-Carboxymethylcellulose