

Dedication

To

My parents

My teachers

My friends

Acknowledgements

I thank Allah for giving me health and strength for completing this work am deeply grateful to my Supervisor Dr. Adil Elhag Ahmed for his patience and endless help that enable me to make this research possible I am very grateful to Ms. Safa Abdalbagi and all friends for their valuable advice Last but not least, special warm thanks to my parents and family, for their great encouragement and support.

Abstract

Acacia nilotica wood shaving (Sawdust) is an industrial residue of *acacia nilotica* wood processing. It composes of cellulose, hemicellulose and lignin. This study aims to utilize wood shaving for preparing and characterizing carboxymethylcellulose (CMC). In this study, cellulose was extracted from wasteful *acacia nilotica* wood shaving with sodium hydroxide (NaOH), then converted to commercially valuable CMC material by etherification reaction using MCA as etherifying agents, in the presence of NaOH. Many conditions influence the course of etherification reaction was fixed. These conditions were the weight of cellulose (5 g), weight of MCA (6 g) 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 influence to enhance the degree of substitution (DS). The optimum amount of NaCl needed to produce CMC of high DS value (0.8124) was found to be 10 g. The synthesized CMC Material was characterized by X-Rays Diffraction and FT-IR and they were found to be comparable to commercial CMC materials. This study clearly showed that the biomass *acacia nilotica* wood shaving is promising source of cellulose for the production of commercially valuable CMC material with high DS value.

نشارة خشب السنط هي متبقى صناعي من معالجة الخشب، وتتكون من السليلوز، الهيمى سليلوز، والليجنين. هذه الدراسة تهدف للإستفادة من نشارة خشب السنط لتصنيع وتشخيص مادة كاربوكسى ميثيل السليلوز. فى هذه الدراسة تم إستخلاص السليلوز من متبقى خشب السنط (النشارة) بواسطة هيدروكسيد الصوديوم. ومن ثم تم تحويل السليلوز المستخلص الى مادة الكربوكسى ميثيل سليلوز الصوديوم بواسطة تفاعل الاثيرة بإستخدام مادة حمض الخليك احدى الكلور كعامل اثيرة فى وجود هيدروكسيد الصوديوم. تم ضبط بعض الظروف المؤثرة على التفاعل مثل وزن حمض الخليك احدى الكلور، المذيب، ودرجة الحرارة. و قد تم إستبدال مذيب الأيسوبروبانول بالإيثانول الأكثر أمنا والأقل تكلفة. بالإضافة لذلك تم إضافة مقادير مختلفة من ملح كلوريد الصوديوم لدراسة تأثيرها على زيادة درجة الإستبدال (0.8124) هو 10 جرام. تم تشخيص كلوريد الصوديوم المضاف اللازم للحصول على أعلى درجة إستبدال (0.8124) هو 10 جرام. تم تشخيص مادة الكاربوكسى ميثيل السليلوز المصنعة بواسطة جهاز حيود الأشعة السينية وجهاز مطيافية الأشعة تحت الحمراء و وجد أنها تماثل مادة الكاربوكسى ميثيل السليلوز التجارية. هذه الدراسة توضح إمكانية إستخدام نشارة الخشب كمصدر واعد للسليلوز لإنتاج مادة خام لتحضير مادة كاربوكسي ميثيل السليلوز.

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List of abbreviations

Abbreviation	Full name
CMC	Carboxymethylcellulose
DS	Degree of substitution
FT-IR	Fourier transforms infrared
H-CMC	Acid carboxymethylcellulose
Na-CMC	Sodium-carboxymethylcellulose
Na-MCA	Sodium monochloroacetic acid
AGU	Anhydroglucose units