ABSTRACT

Title	:	Efficiency of 1-Butyl-3-Methylimidazolium Chloride As Solvent for the Regeneration of Cellulose from Banana (*Musa paradisiaca Linn.)* Pseudostems For Ethanol Production
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This study was conducted primarily to determine the efficiency of 1-butyl-3-methyl imidazolium chloride as solvent for the regeneration of cellulose from the pseudostems of banana (*Musa paradisiaca Linn.),* locally known as *Saba,* for ethanol production. Several trials were performed to determine the optimum temperature and concentration for the dissolution process. The mixture was observed to be most soluble at a concentration of 10% w/w with 6 hours of heating at a temperature of 130°C using an oil bath. The solvent [bmim]Cl was recovered and used for another set of experiments. Recycling was done twice and the efficiency was evaluated based on the yield and the quality of the regenerated cellulose as well as the amount of solvent recovered in the process. Analysis showed that the cellulose fiber regenerated by using

pure [bmim]Cl contains an average of 51.18% ∝ - cellulose while 50.24% and 50.63% for the second and third treatments respectively for cellulose fibers regenerated by using recycled [bmim]Cl. Decrease in the degree of crystallinity for each samples treated was observed when examined through powdered X-ray diffraction. The effect of the solvent treatment on the crystallinity was determined and related to the rate of enzymatic hydrolysis for ethanol production.

The following findings were noted from this study:

Powdered banana (*Musa paradisiaca Linn.)* pseudostems was dissolved using pure [bmim]Cl and recycled [bmim]Cl up to a concentration of 10% w/w with heating at a temperature of 130°C. There is only a minimal decrease in the % yield of regenerated cellulose fiber using recycled [bmim]Cl in the dissolution process. The solvent [bmim]Cl can be recovered and recycled. There is no significant difference in the quantity and quality of the cellulose regenerated using unrecycled and recycled [bmim]Cl.The crystallinity of the regenerated cellulose was decreased using both recycled and unrecycled [bmim]Cl. Regenerated cellulose fibers from banana (*Musa paradisiaca Linn.)* pseudostems can be hydrolyzed enzymatically to glucose to produce ethanol and the % yield of ethanol decreased as the solvent was recycled.

The following conclusions were made based on the findings in the study:

The ionic liquid [bmim]Cl was proven to be a good alternative solvent for regeneration of cellulose from banana pseudostems .The % yield of the regenerated cellulose is not greatly affected for each treatments using pure and recycled [bmim]Cl .The solvent [bmim]Cl can be recovered after each treatment and the quantity are decreased as the number of recycling process are repeated. The decrease in the degree of crystallinity of the regenerated cellulose increases the rate of enzymatic hydrolysis. The % yield of ethanol was appreciably affected by the decrease of crystallinity of the regenerated cellulose and the purity of the solvent [bmim]Cl

Based on the above findings and conclusions, the following suggestions are made to improve the study:

Variations in the contact time between powdered banana pseudostem and [bmim]Cl before dissolution should be made to further determine the extent of the solvent's effect on the crystallinity of cellulose. Dissolution of the mixture in a microwave oven designed for laboratory purposes is suggested to achieve a better temperature control and to reduce the heating time for dissolution. A comprehensive study on the aqueous biphase systems developed between aqueous [bmim]Cl and the salts being used in the separation of the solvent from water is proposed. The use of other separation methods must be developed for [bmim]Cl and water mixture for greater per cent recovery. Explore on the other possible commercial uses of regenerated cellulose with [bmim]Cl as solvent. An

analysis of the molecular structure of [bmim]Cl must be explored at different stages of recovery. The use of other parts such as leaves, stalks and fruit peels as samples for the regeneration using [bmim]Cl. Compare the quality and quantity of the regenerated cellulose using different varieties of banana. Use other ionic liquids in the regeneration process.