THE INFLUENCE OF TEMPERATURE AND TIME ON EXTRACTION OF LIGNIN USING HYDROPHOBIC DEEP EUTECTIC SOLVENT (HDES) AS PRETREATMENT OF CORN STOVER

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ABSTRACT

THE INFLUENCE OF TEMPERATURE AND TIME ON EXTRACTION OF LIGNIN USING HYDROPHOBIC DEEP EUTECTIC SOLVENT (HDES) AS PRETREATMENT OF CORN STOVER

The composition of lignocellulosic corn stover is found to be suitable for the production of bioethanol but the presence of lignin in the structure could inhibit the later enzymatic hydrolysis process. Previous studies on the pretreatment processes on a variety of lignocellulosic wastes (LCAWs) faces several disadvantages such as high energy consumption, difficulty in controlling the system, formation of inhibitors and toxicants, and the usage of expensive chemicals. Deep eutectic solvent (DES) was introduced in the effort to delignify corn stover and was found to achieve a good result with the use of a non-toxic solvent. Most of the previous studies uses hydrophilic DES and despite its green property, data on the use of hydrophobic DES (HDES) in delignification of corn stover has been lacking. In this study, the effect of temperature and time on extraction of lignin in corn stover using HDES were evaluated. Hydrophobicity of prepared solvent of octanoic acid : DL-menthol at 2:1 mole ratio was confirmed through formation of two layers when mixed with water. It was found that, the percent of lignin extracted by prepared HDES increases with increasing temperature of 50 °C to 125 °C with the lowest to the highest being at 61.16% and 86.33% respectively. This is due to the alteration of corn stover composition and decreases of viscosity of prepared HDES at high temperature, providing easier access to lignin in corn stover. Inversely, the increasing stirring time from 10 to 30 minutes lowers the percent of lignin extracted with 86.33% being the highest value and 30.93% being the lowest value. This could be due to the formation of pseudo-lignin at longer reaction time that attaches itself on the cellular surface and blocks the access to the inner part of corn stover structure. Lignin extraction was further confirmed through functional group analysis where weakened C-O and -OH groups of alcohol and C=C group for benzene ring peaks were observed which indicates the decrease of lignin content in the treated corn stover thus proving the effectiveness of prepared HDES in lignin removal as pretreatment of corn stover.

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