PELARUTAN LIGNIN DAN DELIGNIFIKASI MATERIAL LIGNOSELULOSA MENGGUNAKAN CAIRAN IONIK EUTEKTIK BERBASIS KOLINIUM KLORIDA SEBAGAI AKSEPTOR IKATAN HIDROGEN

SKRIPSI

diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Program Studi Kimia

Oleh

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ABSTRAK

Lignoselulosa yang ramah lingkungan, berbiaya rendah dan sifat biodegradabilitas tinggi menjadi alasan terjadinya pergeseran ketergantungan sumber daya berbasis minyak bumi ke sumber daya berbasis biomassa. Lignin, yang merupakan salah satu komponen lignoselulosa, memiliki kelarutan rendah akibat strukturnya yang kompleks. Kelemahan tersebut membatasi isolasi lignin dan konversinya menjadi produk bernilai tambah. Tujuan penelitian ini adalah untuk melakukan studi pelarutan lignin dan mendelignifikasi material lignoselulosa berupa serabut kelapa (SK) menggunakan cairan ionik eutektik atau *eutectic-based ionic liquids* (EILs) berbasis kolinium klorida (ChCl) sebagai akseptor ikatan hidrogen dengan dua jenis donor ikatan hidrogen, yaitu ChCl-resorsinol (CR) dan ChCl-asam oksalat (CO). EILs disintesis melalui metode pemanasan dengan pencampuran dua komponen dan pengadukan konstan pada 100℃. Pembentukan EILs dibuktikan dengan studi Spektroskopi Inframerah (FTIR). Berdasarkan metode FTIR, terbukti bahwa EILs CR dan CO terbentuk dengan adanya pergeseran dan pelebaran pita serapan gugus OH pada 3464-3364 cm^{-1} menjadi 3600-3020 cm^{-1} yang terjadi karena pembentukan ikatan hidrogen pada EILs. Studi pelarutan lignin dan selulosa menunjukkan bahwa CR memiliki kinerja yang lebih baik daripada CO, dengan %-kelarutan lignin *kraft* dan selulosa berturut-turut adalah 46,70% dan 6,40%. Studi delignifikasi menunjukkan bahwa CR memiliki kinerja yang lebih baik dalam pelarutan lignin pada SK dibandingkan dengan CO. Hal ini dibuktikan oleh hasil karakterisasi FTIR CR-lignin SK memiliki puncak serapan khas lignin dengan intensitas yang lebih kuat daripada CO-lignin SK. Adapun hasil SEM (*scanning electron microscopy*) saat SK didelignifikasi oleh CR (SKR) memiliki struktur permukaan yang lebih terdekomposisi dan serat yang lebih terpecah dibandingkan SK yang didelignifikasi oleh CO (SKO). Hasil uji FTIR pada spektra SKR daerah antara 1325-1220 cm^{-1} intensitas serapan lignin lebih lemah daripada SKO. Dengan demikian, EILs ChCl-CR terbukti dapat menjadi pelarut untuk proses delignifikasi dari serabut kelapa. Eksplorasi metode pelarutan lignin menggunakan EILs diharapkan dapat menjadi metode yang menjanjikan untuk isolasi material berbasis lignin.

Kata Kunci: delignifikasi, *eutectic-based ionic liquids,* kolinium klorida-resorsinol/asam oksalat, lignin, serabut kelapa.

ABSTRACT

Lignocellulose is environmentally friendly, low cost and high biodegradability is the reason for the shift from petroleum-based resources to biomass-based resources. Lignin, which is one of the components of lignocellulose, has low solubility due to its complex structure. These drawbacks limit lignin and its conversion into value-added products. The purpose of this research is to study the dissolution and delignification of lignocellulosic materials in the form of fibers (SK) using eutectic or eutectic ionic liquids or eutectic-based liquids (EILs) cholinium chloride (ChCl) as a hydrogen acceptor with two types of hydrogen donors, namely ChCl-resorcinol (CR) and ChCl-oxalic acid (CO). EILs was synthesized by heating method with mixing of two components and constant stirring at 100℃. EILs is proven by Infrared Spectroscopy (FTIR) studies. Based on the FTIR method, it was proven that EILs CR and CO were formed by the shift and widening of the absorption band of the OH group at 3464-3364 cm^{-1} to 3600-3020 cm^{-1} which occurred due to the formation of hydrogen in the EILs. The study of dissolution of lignin and cellulose showed that CR had better performance than CO, with %-solubility of kraft lignin and cellulose were 46.70% and 6.40%, respectively. The delignification study showed that CR had a better performance in dissolving lignin in SK compared to CO. This is evidenced by the results of the FTIR characterization of CR-lignin SK which has a characteristic absorption peak of lignin with a stronger intensity than CO-lignin SK. The results of SEM (scanning electron microscopy) when SK was delignified by CR (SKR) had a more decomposed surface structure and more split fibers than SK delignified by CO (SKO). The results of the FTIR test on the SKR spectra in the area between 1325-1220 cm^{-1}, the lignin absorption intensity was weaker than the SKO. Thus, EILs ChCl-resorcinol proved to be a solvent for the delignification process of coconut fiber. Exploration of the lignin dissolution method using EILs is expected to be the expected method for lignin-based insulating materials.

Keywords: delignification, eutectic-based ionic liquids, choline chloride-resorcinol/oxalic acid, lignin, coconut fiber

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