

## ABSTRAK

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Penelitian ini dilakukan untuk mengetahui potensi cairan ionik berbasis kation *fatty imidazolinium* sebagai pelarut selulosa dalam pengolahan awal (*pretreatment*) biomassa tandan kosong kelapa sawit (TKKS) pada biokonversi selulosa menjadi glukosa. Cairan ionik yang akan digunakan disintesis dengan melakukan substitusi gugus alkil pada kation, yakni dengan gugus *cis*-(Ol-Imz) dengan berbagai variasi anion iodida [I<sup>-</sup>], tiosianat [SCN<sup>-</sup>] dan asetat [CH<sub>3</sub>COO<sup>-</sup>]. Analisis spektroskopi inframerah (FTIR) digunakan untuk menentukan struktur garam hasil sintesis dan keberhasilan sintesis. Proses pelarutan biomassa TKKS dilakukan menggunakan cairan ionik *fatty imidazolinium* dengan berbagai anion menggunakan pemanasan *microwave*. Proses pelarutan tersebut menyebabkan kristalinitas dari selulosa menjadi lebih rendah (dari 63,39% sebelum pengolahan awal menjadi 59,36% setelah pengolahan awal) memperkecil ukuran partikel TKKS (dari 63,55 nm sebelum pengolahan awal menjadi 26,78 nm setelah pengolahan awal) dan meningkatkan kadar glukosa yang dihasilkan dari proses hidrolisis enzimatik. Hasil glukosa selama 48 jam hidrolisis enzimatik sebesar 1,280 mg/mL (menggunakan TKKS-treated-[*cis*-Ol-Imz-CH<sub>3</sub>COO]) > 1,172 mg/mL (menggunakan TKKS-treated-[*cis*-Ol-Imz-SCN]) > 1,098 mg/mL (menggunakan TKKS-treated-[*cis*-Ol-Imz-I]) > 0,431 mg/mL (untreated-TKKS) dengan waktu hidrolisis selama 48 jam. TKKS yang telah diberi pengolahan awal menggunakan cairan ionik berbasis kation *fatty imidazolinium* lebih mudah dihidrolisis oleh enzim *selulase* dan memberikan hasil glukosa yang lebih tinggi dibandingkan tanpa pengolahan awal.

### **Kata kunci:**

*Pengolahan awal biomassa, tandan kosong kelapa sawit (TKKS), selulosa, cairan Ionik, fatty imidazolinium, hidrolisis enzimatik*

## Biomass Waste of Oil Palm Empty Fruit Bunches Modified by Ionic Liquid for Cellulose Processing Into Glucose

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The aim of research to know the potency of ionic liquid based on fatty imidazolium cation as cellulose solvent in the initial treatment (pretreatment) of biomass oil palm empty fruit bunches (EFB) on bioconversion of cellulose to glucose. Three ionic liquids have been synthesized are organic salts of cation cis-oleyl-imidazolium ( $[c\text{-OIIm}]^+$ ) with three anions such as iodide ( $[I]^-$ ), thiocyanate ( $[SCN]^-$ ) and acetate ( $[CH_3COO]^-$ ) and tested as solvents by a *microwave-heating* method. The analysis of infrared spectroscopy (FTIR) was used to determine the structure of salt synthesized and successful synthesis. The process of dissolution of biomass EFB performed using ionic liquids with different anions imidazolium acids using microwave heating assistance. The pretreatment (dissolution and precipitation of cellulose-solution by anti-solvent) reduced the cellulose crystallinity (63.39% to 59.36%), reduced the particle size (63.55 nm to 26.78 nm) and improved the glucose yield of enzymatic hydrolysis. The glucose yields for 48 hours enzymatic hydrolysis were 1.280 mg/mL (using EFB-treated-[cis-OI-Im]  $CH_3COO$ ) > 1,172 mg/mL (using EFB -treated-[cis-OI-Im]  $SCN$ ) > 1,098 mg/mL (using EFB-treated-[cis-OI-Im]  $I$ ) > 0,431 mg/mL (without pretreatment). Pretreatment EFB using ionic liquids based on fatty imidazolium salts make more easily hydrolyzed by the cellulase enzyme and glucose yield is higher than without pretreatment.

**Keywords:** Biomass Pretreatment, Oil Palm Empty Fruit Bunches (EFB), Cellulose, Ionic Liquids, Fatty Imidazolium, Enzymatic Hydrolysis