

Effects of ethanol concentration on organosolv lignin precipitation and aggregation from *Miscanthus x giganteus*

ABSTRACT

This work assesses the behavior of organosolv lignin aggregates derived from *Miscanthus x giganteus* using different ethanol concentrations (10%, 25%, 50%, and 75% by volume). The percentage of lignin recovery was found to decrease from 75.8% to 71.4% and 25.1%, as the ethanol concentration was increased from 10% to 25% and 50%, respectively. Increasing the ethanol concentration further to 75% led to zero recovery. The purity of the precipitated lignin was consistently found to be $\geq 90\%$. Lignin derived from the dried supernatant obtained at 50% ethanol concentration resulted in high lignin purity (51.6%) in comparison with the other ethanol concentrations used. Fourier transform infrared spectroscopy analysis showed that the precipitated lignin and dried supernatant at 50% ethanol concentration possessed the highest peak intensity apportioned to wavenumber of lignin as compared to that of at 25% and 10% ethanol concentrations, and the results linked with the percentage of lignin purity. The results of particle size analysis for precipitated lignin demonstrated particle sizes of 306, 392, and 2050 nm for 10%, 25%, and 50% ethanol concentrations, respectively, and the remaining supernatant with average particle sizes of 1598, 1197, and 875 nm, respectively. These results were verified with the morphology of lignin macromolecules in scanning electron microscopy images. Results of the particle size distribution of lignin revealed that the overall size of lignin aggregates decreased with decreasing ethanol concentration. In summary, these findings suggest that ethanol concentration affected the behavior of lignin aggregates in water–ethanol solution.

Keyword: Lignocellulosic; Organosolv; Lignin; Aggregates; Purity; Concentration