ISSN: 1391-8796
Proceedings of
5th Ruhuna International Science & Technology Conference
University of Ruhuna, Matara, Sri Lanka
February 15, 2018

Extraction and acetylation of lignin extracted from rice straw and sugar cane bagasse.

Panamgama L. A*and Palihakkara I. N. H.

Department of chemistry, University of Ruhuna, Matara, Sri Lanka

Rice straw and sugar cane bagasse are waste resources available plentifully in Sri Lanka. In these materials lignin, a phenolic biopolymer is very high. Lignin is considered as one of the most promising renewable resource for the future. Extraction of lignin from waste materials is advantages. Finely ground 80 mesh size raw materials were Soxhlet extracted with toluene: acetone 1:1 (v/v) solvent mixture with biomass to liquid ratio of 1: 8 %wt. at 70 ^{o}C for 2 h and impurities such as waxes and silica were removed. Three different chemical protocols were utilized to extract lignin from both rice straw and sugar bagasse viz., (i) alkaline 7.5% (w/v) NaOH (90 ^{o}C, 90 min.), (ii) organosolv 85% (v/v) formic and acetic acids at 7:3 (v/v) ratio and (iii) polyethylene glycol: water 80:20 %wt. Wet chemical analysis showed that alkaline process has the highest lignin yield, while organosolv process has the lowest, irrespective of the feedstock. The ash content in rice straw lignin obtained by alkaline process was the highest. By reacting lignin with glacial acetic acid in the presence of pyridine at 90 ^{o}C for 60 min. with solvent to lignin 1: 1 %wt. ratio, the hydrophilic hydroxyl groups of lignin were acetylated. This acetylation could widen its eco-friendly applications to be used in various industrial applications with improved physicomechanical properties. Characteristics of raw and modified lignin were compared by several analytical techniques. Effects of the specific functionalization in each case were assessed spectroscopically with Fourier transform infrared (FTIR) and UV-visible spectra. Each of these techniques revealed significant differences in extent of hydroxyl and carbonyl groups exist in both rice straw and sugar cane bagasse lignins obtained by the three different extraction protocols.

Keywords: Lignin, biopolymer, rice straw, sugar cane bagasse, UV-Vis, FTIR

Acknowledgements: *The authors are very much thankful to the Director and staff of Rubber Research Institute, Rathmalana, for their generous assistance in providing FTIR spectra of lignin samples.*

Corresponding author: asoka@chem.ruh.ac.lk