

Lignin Extractions from Oil Palm Empty Fruit Bunch under Pressurized and Inert Conditions

Md Arfata, Abu Hasnat Mustafaa, Rasidi Roslana and Mohd Hasbi Ab. Rahim

Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, 26300, Kuantan, Pahang, Malaysia

*Corresponding author: mohdhasbi@ump.edu.my

Abstract

In this study, for the first time, lignin was extracted from palm oil empty fruit bunch (EFB) by using a pressurized reactor in the presence of deep eutectic solvents (DES). DES is prepared by mixing choline chloride and oxalic acid at a ratio of 1:1, successfully extracting around 30 wt.% of lignin under a relatively mild temperature. Fourier transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC) are used in order to analyse lignin, whereas X-ray powder diffraction (XRD) is used to investigate the solid residues. FTIR analysis revealed the characteristics of lignin with a major functional group composed of phenolic, aliphatic hydroxyl and conjugated alkene in the FTIR spectra. This was further confirmed with thermal stability data using DSC. The crystallinity of the solid residue consisting of cellulose was observed to be affected by different temperatures, with the highest value (43.5 %) at 80 °C. The yield of lignin extracted under a pressurized and inert environment shows more than double the value of lignin as compared to the analogue process under atmospheric pressure and also shows comparable lignin yield with microwave assisted extraction systems. Thus, it provides a new, facile, and efficient approach to the delignification of lignocellulosic biomass.

Keywords: Empty fruit bunch (EFB), Lignin, Deep eutectic solvents (DES), High-pressure reactor