

Analysis on the performance of hot water extraction and alkaline extraction for sodium hydroxide-assisted steam exploded empty fruit bunch at pilot scale

M. A. F. Supian; S. Mohamad; Z. H. Ismail; K. N. M. Amin; S. S. Jamari; S. M. Shaarani; J. Zakaria; A. Abdullah

Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, 26300
Gambang, Pahang, Malaysia

*Corresponding author: shahrilm@ump.edu.my

ABSTRACT

Empty fruit bunches (EFB) contribute the most to the biomass waste produced from palm oil industries. Biomass waste is made up of cellulose, hemicellulose, and lignin. By having high cellulose content, it has great potential for cellulose production. However, the cellulose extraction process has yet to be optimized. Therefore, the study on the operating conditions in extracting cellulose from EFB takes place by understanding the sodium hydroxide (NaOH) soaking process prior to steam explosion pre-treatment. The effects of retention time on the hot water extraction (HWE) treatment and NaOH concentration on the alkaline extraction (AE) treatment in term of the amount of dissolved sugar were observed. The chemical properties of original fibre and treated fibre were analysed by Fourier Transform Infrared (FTIR) Spectroscopy and the surface morphology were observed using scanning electron microscopy (SEM). In this study, it is found that the best condition for alkaline extraction was at 10% alkaline concentration and the FTIR spectroscopy shows that there are no changes on the chemical structure of the fibre. SEM also shows the changes on the surface morphology of the fibre. Showing that the sodium hydroxide assisted steam explosion pre-treatment does greatly influence the further process.

KEYWORDS:

Alkalinity; Cellulose; Fibers; Fourier transform infrared spectroscopy