Hydrothermal treatment of oil palm wood: effect of treatment variables on dimensional stability using response surface methodology

ABSTRACT

Oil palm wood (OPW) extracted from felled oil palm trunks during replanting could be a source of replenishment for the depleted timber sources. Nevertheless, dimensional instability of OPW is one of the drawbacks that need to be addressed before it can be utilised efficiently. Therefore, to improve its dimensional stability, hydrothermal treatment using different buffered media was employed in this study and the optimal treatment condition for OPW were investigated. Response surface methodology (RSM) models for treatment temperature, treatment duration and buffered media of hydrothermally treated OPW were developed. OPW samples were hydrothermally treated with different buffered media (pH 4 to pH 9), treatment temperature (60oC to 160oC) and time (13 min to 147 min). Water absorption (WA) and thickness swelling (TS) of the treated samples were determined. It is demonstrated that hydrothermal treatment has improved the dimensional stability of treated samples with treatment temperature appearing to be the most influential factor. Samples treated in an acidic media displayed lower WA mainly due to the fact that higher amount of hydrophilic hemicellulose was degraded under acidic condition. However, lower TS was observed in the samples treated in alkaline media, probably caused by the removal of lignin that increased the porosity of the OPW.

Keyword: Buffered media; Central composite design; Hydrothermal treatment; Thickness swelling; Water absorption