

Chemical and thermal properties of lignins from oil palm biomass as a substitute for phenol in a phenol formaldehyde resin production

Abstract

Lignins were extracted from oil palm empty fruit bunch after kraft and soda pulping process. The aim of this study was to characterise the chemical and thermal properties of these lignins as well as determine their suitability for partial incorporation into phenol formaldehyde resin. The analytical methods used were CHN analyser, FTIR spectroscopy, UV spectroscopy, TGA, DSC, GPC, ¹H NMR and FESEM. The elemental analysis results showed that both lignins had similar contents of C, H and O. FTIR spectra also revealed that both lignins have similar functional groups. Nevertheless, both lignins showed different compositions in terms of molecular weight distribution (M_n , M_w and polydispersity), reactive site through Mannich reactivity analysis, surface morphology and T_g value. The phenolic hydroxyl group content in kraft and soda lignins is 4.1076 mmol/g and 2.5830 mmol/g, respectively. The TGA thermogram showed both lignins had high thermal stability. Based on these analyses, kraft lignin from oil palm empty fruit bunch showed tremendous potential as a partial substitute for phenol in phenol formaldehyde resin production.