Optimization of polyol production via liquefaction from *Acacia mangium* and analysis of the polyols by traditional methods and two-dimensional correlation spectroscopy

ABSTRACT

The aim was to optimize the liquefaction conditions of *Acacia mangium* wood flour with polyethylene glycol (PEG#400) as the solvent in the presence of sulfuric acid as a catalyst under atmospheric pressure. Reaction time (30–180 min), temperature (130–170°C), and the solvent ratio (PEG/glycerol=0–25%) were varied to obtain the lowest residue content. The resulting polyol was characterized by their hydroxyl number (OHN), acid number (AN), viscosity, molecular weight (M_w), thermogravimetric analysis, Fourier transform infrared (FT-IR) and two-dimensional correlation spectroscopy (2D-COS). The OHN was lowered, AN and M_w were elevated as a function of increasing the reaction temperature and the time. Introducing glycerol in the PEG system markedly increased the OHN, AN and viscosity of the liquefied wood. The optimum condition was 80/20% ratio of PEG/glycerol at 150°C in 150 min leading to a 75% liquefaction yield. The 1730 cm^{-1} band was indicative for the esters in the liquefied product. The 2D-COS analysis showed that lignin is easily liquefied at high temperatures and a decreasing amount of PEG, and that the presence of glycerol significantly enhanced the 1730 cm^{-1} band.