Characterisation of sequential solvent fractionasation and based-catalysed depolymerisation of treated alkali lignin

ABSTRACT

An alkali lignin (OL) with a weight-average molecular weight (*M*w) of 11646 g/mol was used to prepare low-molecular weight lignin for resin synthesis. The low-molecular weight lignin feedstock was obtained *via* base-catalysed depolymerisation (BCD) treatments at different combined severity factors. Sequential fractionation of the OL and BCD-treated lignins using organic solvents with different Hildebrand solubility parameters were used to alter the homogeneity of the OL. The yield and properties of OL itself and OL and BCD-treated OL dissolved in propan-1-ol (F1), ethanol (F2), and methanol (F3) were determined. Regardless of the treatment applied, a small amount of OL was dissolved in F1 and F2. The BCD treatment did not increase the yield of F1 but did increase the yields of F2 and F3. Gel permeation chromatography (GPC) showed that the repolymerization reaction occurred in F3 for all BCD-treated OL, so these lignins were not suitable for use as feedstocks for resin production. The GPC, 13Carbon-nuclear magnetic resonance, and Fourier transform infrared spectroscopy analyses confirmed that the F3 in OL exhibited the optimum yield, molecular weight distribution, and chemical structure suitable for use as feedstocks for resin synthesis.

Keyword: Lignin; Organic solvent fractionation; Alkaline hydrolysis; Molecular weight distribution; Functional groups