

### GPC-assisted assessment of catalytic depolymerization of lignin

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Complex structure of lignin, abundant natural amorphous polymer, has been a challenge to valorize lignin. In order to develop the reliable chemical processes to reduce complexity of lignin, the depolymerization of commercially available alkali lignin was studied in an aqueous ethanol-water solution using noble metal catalysts. Hydrogenation of lignin using supported noble metal catalysts was performed in order to obtain lignin-derived phenolic compounds and oligomers. Optimal reaction conditions for depolymerization of lignin were studied. The bonds between lignin monomers were cleaved during the catalysis, and the small molecule products and the polymeric lignin residue were obtained. The catalytic performance was assessed using a gel-permeation chromatography. The molecular weight distribution of lignin, when treated with different catalysts, exhibited the formation of decomposed lower molecular weight polymer. Small molecule products including guaiacol, 4-ethylguaiacol, iso-eugenol, and 2-methoxy-4-propylphenol were also identified and quantified using GC/MS and GC-FID. Reactants and products of lignin were also characterized using SEM, NMR and FT-IR, which helped understand the nature of depolymerization.