Catalytic Depolymerization of Lignin by Hydrogenolysis

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Lignin is a complex natural amorphous polymer commonly regarded as waste from the pulping process and from biofuel production. The depolymerization of lignin using supported noble metal catalysts were performed to produce aromatic hydrocarbons which can be used as sustainable fuels and feedstocks for chemical processes. Ethanol/water mixtures solubilized lignin when heated to 225℃ at 40 bar H2 pressure with little residual solids. The aromatic small-molecule hydrocarbon products were identified and quantified using GC/MS and GC-FID. The polymerization activity was assessed by weighing the polymeric products of lignin residue and observing their GPC results, which helped understand the catalytic depolymerization behavior. The polymeric lignin residue was further observed with FT-IR, SEM, and NMR, and particularly 31P-NMR observed the formation of guaiacyl OHs during the reaction, indicating the cleavage of guaiacyl ether bonds.