

Valorization of strong acid hydrolysis lignin in supercritical ethanol and formic acid

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Lignin is one of the most abundant carbon-based biopolymer on the earth which has a myriad potential for the production of renewable fuels and chemicals. The valorization of lignin depends on its structure which varies with its origin and pretreatment technique, therefore a sophisticated method is required to breakdown the lignin structure. Here we demonstrated the depolymerization of Kraft and strong acid hydrolysis (SAH) lignin in the presence of supercritical ethanol and formic acid as a hydrogen source at 350°C and the short reaction time of 30 min. The effect of lignin type, reaction time and the formic acid to lignin ratio were studied. Under similar reaction conditions the Kraft lignin depolymerized significantly with 98% conversion whereas the conversion in case of strong acid hydrolysis lignin remained 86%. The molecular weight distribution analyzed by GPC showed the oil obtained from Kraft lignin has lower molecular weight ( $M_w = 730$  g/mol) as compared to SAH lignin ( $M_w = 855$  g/mol). The elemental analysis shows that the resultant oil has 45% reduction in O/C ratio compared to the original lignin. The monomeric products having wide range of functionalities were identified and quantified by GC-MS, mainly composed of phenols, esters, alcohols and traces of aliphatic compounds.