Catalytic Cleavage of Lignin and its Derivatives into Aromatic Compounds

Feng Wang†
Dalian Institute of Chemical Physics, Chinese Academy of Science
(chem@kiche.or.kr†)

Biomass is renewable and the most abundant carbon resource, and it shows great potential for sustainable production of chemicals in the future. As biomass resources are generally polymers and the C–C bond is the backbone, the oxidative cleavage of C–C bond can break up the biomass to small molecules and introduce acid functionality at the same time. Oxidative cleavage of C–C bonds of lignin model compounds and lignin extracts is deemed to be a promising way to achieve lignin depolymerization. We herein propose a "cutting tail" methodology to produce phenol from lignin, which is achieved by combining Ru/CeO2 catalyst and CuCl2 oxidant via an oxidation–hydrogenation route. Phenol was obtained from separated poplar lignin with 13 wt % yield. Even raw biomass, such as poplar, birch, pine, peanut, bamboo willow, and straw, could be converted into phenol in 1–33 mg per gram of biomass. We also find a mild photocatalytic oxidative strategy for C–C bond cleavage of lignin β-O-4 and β-1 linkages using a mesoporous graphitic carbon nitride catalyst.