

Production of Phenolic Hydrocarbons by Catalytic Depolymerization of Organosolv Lignin

Deokwon Son^{1,2}, Minsun Kim^{1,2}, Jae-Wook Choi¹, Jeong-Myeong Ha^{*,1,2}, Jungkyu Choi²

¹ Korea Institute of Science and Technology, Seoul 136-791, Republic of Korea

² Korea University Seoul 02841, Republic of Korea

*E-mail: jmha@kist.re.kr

Lignin is a natural polymer, composed of phenolic monomers, which constitutes approximately 30% of woody biomass. As a renewable biomass feedstock, lignin has been a potential sustainable resource for production of both aromatic fuels and chemicals. While several lignin products from lignocellulose have been developed as byproducts of pulping processes, and organosolv lignin extracted from palm empty fruit bunch (EFB) is selected as a feedstock in this study because its structure is not much damaged without ash and catalyst-poisoning sulfur [1]. The depolymerization of lignin was performed using supported metal catalysts in an organosolv lignin-dissolved aqueous ethanol solution [2]. The small molecule products of aromatic compounds and the degraded lignin polymers with the smaller molecular weights are obtained and quantified using a GC-FID/MS.

Supported metal catalysts with a high pressure H₂ were used for the depolymerization. Acidic zeolites were selected as supports of metals and solid acids to improve the acid-initiated degradation of ether-bonded lignin polymer. H β -supported Ru catalyst achieved 16.5% yield of small molecule phenolic hydrocarbons including guaiacol, 4-methylguaiacol, 4-ethylguaiacol, cerulignol, and iso-eugenol (Fig. 1).

In addition to the small molecule products, the high molecular weight polymer products were also quantified, which exhibited 63% decreased weight-average molecular weight based on gel permeation chromatography (GPC) results (Fig. 2). The polymer products was further observed with ¹H, ¹³C, ³¹P-NMR and ¹H-¹³C HSQC NMR, which indicated that the the removal of β -O-4 bonds occurred to produce small molecule products and polymer

residue by the reaction on the solid-acid-supported metal catalysts. The structure of EFB-extracted organosolv lignin was also discussed based on the characterization results [3].

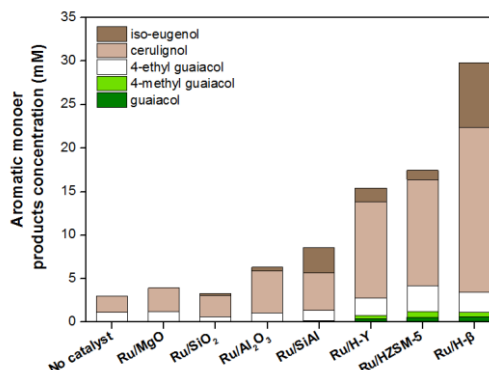


Fig.1 Small molecule products after the depolymerization using supported 5wt% Ru catalysts.

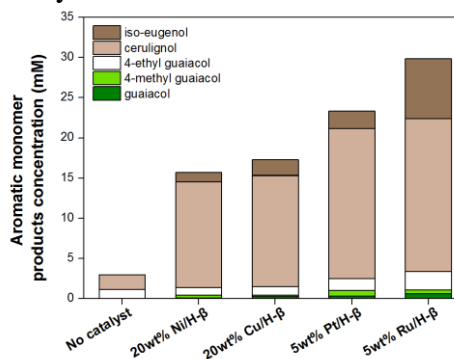


Fig.2 Polymer products after the depolymerization using supported 5wt% Ru catalysts.

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