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# Controllable production of guaiacols and phenols from lignin depolymerization using Pd/C catalyst cooperated with metal chloride

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## Abstract:

Many effective methods have been proposed to achieve lignin depolymerization, while controllable product distribution is still hard to realize. Herein, an efficient lignin hydrogenolysis process with controllable product distribution was put forward using Pd/C catalyst cooperated with metal chloride. Results showed that lignin produced a high amount of guaiacols in the presence of ZnCl<sub>2</sub>, while a high amount of phenols in the presence of CrCl<sub>3</sub>. Guaiacylglycerol- $\beta$ -guaiacyl ether was used as the model compound to carry out the mechanistic investigation. A synergetic catalysis effect between Pd/C and metal chloride was exhibited in this process. And the Lewis acidity was an important factor to determine the product distribution. With the synergetic catalysis of Pd/C and metal chloride, the dissociation energy of  $\beta$ -O-4 bond was reduced significantly, which made the cleavage easier to realize. The phenolic monomer product of guaiacols was produced in the initial stage. CrCl<sub>3</sub> catalyst with strong Lewis acidity could further promote the occurrence of demethoxylation and

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