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One-Pot Lignocellulosic Biomass Conversion into Selective Chemicals over Bimetallic CuRu-based Catalyst

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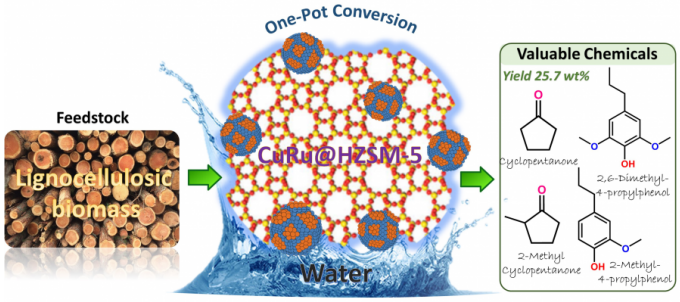
PURPOSE OF THE ABSTRACT

Lignocellulosic biomass, which is one of the most abundant and bio-renewable resources on the earth, having a great potential for sustainable production of chemicals and fuels. Chemocatalytic biomass conversion over multifunctional catalysts into selective chemicals is a new approach, which can provide a wider range of products with high selectivity and high yield of value-added chemicals. Herein, Ru-doped Cu/ZSM-5 multifunctional catalysts were used to direct conversion of biomass or biomass-derived components into selective commodity chemicals such as cyclopentanone (CPO), methylcyclopentanone (mCPO) and lignin derived monomeric (LDM) species, which have a wide range of applications in pharmaceutical and agricultural industries. The maximum 97% conversion of oakwood biomass with the total yield of 25.7 wt% of selective products (CPO, mCPO, and LDM) were achieved at 300 oC, 3.0 MPa initial pressure of H2 for 30 min reaction under subcritical water conditions. A rationale behind to use bimetallic Ru-Cu system was to increase the hydrogenolysis strength of the Cu active site, which could be more helpful to hydrogenolyses the C-O bond, resulting high-yield CPO, mCPO and lignin-derived monomers. Conversion of some lignocellulosic-derived model compounds were performed to verify mechanistic pathways.

FIGURES



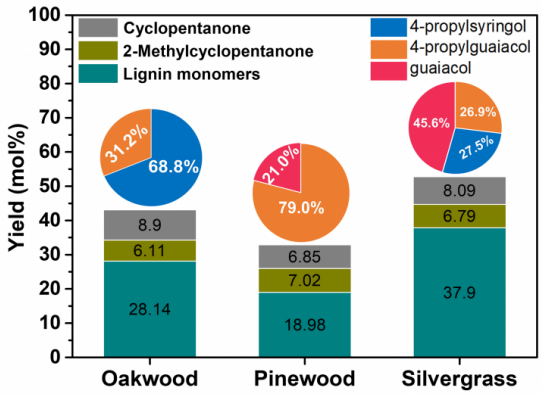


FIGURE 1

One-pot catalytic conversion of lignocellulosic biomass

Lignocellulosic biomass is used without pre-treatment and is completely converted to selective valuable products over bimetallic CuRu@ZSM-5 catalyst.

FIGURE 2

Results on the full conversion of various types of lignocellulosic biomass

Reaction conditions: 500 mg feedstock, 250 mg CuRu@ZSM-5 catalyst, 30 ml H2O; 300 oC; 3.0 MPa H2, 1 h.

KEYWORDS

Biomass | BImetallic CuRu catalyst | Cyclopentanone and its derivatives | Lignin monomers

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