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One-Pot Cellulose Biomass Conversion into Selective Chemicals over Bimetallic Cu-Ru Zeolite-Y based Catalyst in Supercritical Methanol Conditions

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PURPOSE OF THE ABSTRACT

The decline of fossil fuel resources elevates the development of alternative energy sources and green chemicals. Efforts focused on the production of chemical and fuels from cellulose have described a bright sustainable future by providing a panel of value-added compounds such as monosaccharides, furanics, alcohols, alkanes, acids, and others. These compounds may find important applications such as chemical reagents, fuel additives, solvents, polymer monomers or precursors for other compounds of special purposes. Among the value-added chemicals, ?-valerolactone (GVL) and levulinic acid (LA) or its derivatives are considered as promising building block chemicals, which have a huge industrial importance. However, the direct conversion of lignocellulosic derived feedstocks or cellulose to such compounds with high selectivity and high-yield is still a great challenge. Herein, we proposed a one-step process for direct conversion of cellulose to methyl levulinate and GVL with very high selectivity and yield under supercritical methanol conditions over bimetallic CuRu/H-ZY catalyst. At the optimized reaction condition of 245 °C, 3.0 MPa of initial N2 pressure and 2 h reaction time, the maximum yield of methyl levulinate and GVL of about 65 mol% and 20 mol%, respectively, with the complete conversion of cellulose. In this process, the production of GVL resulted from cyclization of methyl levulinate over Lewis acid sites of zeolitic support under the N2/H2 atmosphere. Notably, in-situ hydrogen could be produced over Cu NPs through methanol steam reforming process in the presence of water.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

Biomass conversion | Cellulose | Methyl levulinate | Gamma valerolactone

BIBLIOGRAPHY