

Hydrolytic Hydrogenation of Cellulose to Ethylene Glycol and Hexitols in One Pot

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ABSTRACT

Cellulose is a renewable feedstock, which can be used as an alternative to fossil fuel for the production of a wide range of chemicals. The present study focusses on hydrolytic hydrogenation of cellulose in one pot using Ru/C in combination with heteropolyacid (HPA) supported on zirconia. The catalysts showed good activity towards selectively producing ethylene glycol and hexitols. The ball-milling pretreatment of cellulose resulted in significant reductions in its crystallinity which promoted the catalytic performance. Under optimum conditions (220 °C, 5 h) a conversion of ~100% was achieved with good product yield. We proposed a plausible reaction pathway based on the experimental results which indicated that Ru/C catalyzed hydrogenation reaction while hydrolysis and retro-aldol condensations reactions were catalyzed with HPA/zirconia. Interestingly, the synthesized catalytic system also showed good recyclability and stability.

Keywords: Cellulose; Sorbitol; Ethylene Glycol; Heteropolyacid; Hydrolytic Hydrogenation

