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Co-production of ethanol and 1,2-propanediol via glycerol hydrogenolysis using Ni/Ce–Mg catalysts

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Biodiesel-byproduct glycerol is a potential feedstock for the production of biofuels and valuable chemicals. Its hydrogenolysis can lead to the production of C1-C3 alkanes and/or mono/di-alkanols with their yields depending on the catalysts and conditions used. In this work, we developed Ni catalysts for the co-production of ethanol and 1,2 propanediol from glycerol hydrogenolysis. Various supports for Ni were tested with CeO₂ supported Ni showing potential for ethanol and 1,2 PDO production. Addition of Mg as a promoter at Ce:Mg ratio of 9:1 with 25 wt% Ni provided good selectivities of about 15% and 62% for ethanol and 1,2 PDO, respectively. Changing the catalyst preparation from impregnation to deposition precipitation method resulted in a 60% improvement in the rate of glycerol conversion, while maintaining selectivities for the main products. Modification of catalyst calcination temperature and various reaction conditions were also observed to affect ethanol and 1,2 PDO production. The catalyst developed in this work showed a better potential for the selective co-production of ethanol and 1,2 PDO in comparison with the commercial Raney[®] Ni catalyst.

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