Conversion of succinic acid over Ni and Co catalysts

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Liquid-phase hydrogenation of succinic acid (SA) over supported Ni and Co catalysts was investigated at 200 °C and 6 MPa of H2. Reduced and passivated catalysts with the same surface metal density (2.5 atoms of metal per nm2 of support) were prepared by incipient wetness impregnation. The catalysts were characterized by X-ray diffraction (XRD), N2 adsorption, X-ray photoelectron spectroscopy (XPS), temperature-programmed reduction (TPR), CO-chemisorption, and temperature-programmed desorption of NH3 (TPD-NH3). The Ni and Co catalysts supported over SiO2 showed different product distribution, due to the adsorption of the SA over the surface of catalysts, determined by DFT calculations. The Co/SiO2, Co/SiO2-Al2O3, and Co/Al2O3 catalysts showed different product distribution, which was correlated with total acidity from TPD-NH3 results. In general, the Co catalysts promoted the hydrogenation process; however, the highest total acidity showed by Co/Al2O3 also promoted the dehydration process. Finally, the initial rate follows the trend according to the dispersion determined by CO-chemisorption.

Biomass

Catalytic hydrogenation

DFT-calculations

Succinic acid

Ammonia

Chemisorption

Cobalt

Dehydration

Hydrogenation

Nickel

Silica

Silicon

Temperature programmed desorption

X ray photoelectron spectroscopy

CO chemisorption

Dehydration process

Hydrogenation process

Incipientwetness impregnation

Liquid-phase hydrogenation

Ni and co catalysts

Product distributions

Temperature-programmed reduction

Catalyst supports