SUPPLEMENTARY INFORMATION

Highly efficient nitrogen-doped hierarchically porous carbon supported Ni nanoparticles for the selective hydrogenation of furfural to furfuryl alcohol

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Experimental Details

Synthesis of Ni/CN catalyst:

A facile one-pot co-gelation sol-gel technique was used for the synthesis of hierarchically porous monolithic Ni/CN catalysts as reported elsewhere.[36] Nickel (II) acetate tetrahydrate salt was used as Ni precursor. Catalysts with varying Ni loadings (1, 2.5, 5 and 10 wt%) were prepared. As an example, a typical co-gelation synthesis of the 1 wt% Ni/CN monoliths is described below–

In a 250 mL beaker, resorcinol crystals (9 g), tri-block co-polymer Pluronic F127 (3.75 g), ethyl alcohol (27 g) and deionized (DI) water (27 g) were added to the same beaker and the solution was stirred until a transparent solution was observed. 1,6-diamino hexane (0.2314 g) was added, turning the solution basic and the solution was stirred for 15 min (pH~9.06). The Nickel (II) acetate tetrahydrate salt (0.1415 g) was dissolved in 2 mL DI water and added to above-mentioned transparent brown solution. The pH of the solution was observed to decrease to 8.79. This was followed with the addition of formalin solution (13.26 g) with continued stirring for 10 min. The resultant greyish, cloudy solution was degassed under vacuum for 10 min for the removal of the trapped air and transferred to cylindrical molds. The molds were sealed with lids and placed in a pressure cooker that contained 50 mL each of ethyl alcohol and DI water. The pressure vessel was kept in an oven at 80 °C for 24 h. After cooling to room temperature, the monoliths were removed from the pressure vessel and kept at 55 °C for two days in an oven (to enable maximum evaporation of the solvent). The resulting monolithic gel was dried at 100 °C in a tubular furnace under N_2 gas flow for 4 h. The dried monolithic columns were then simultaneously carbonized and the Ni was reduced under 5% H_2/N_2 at 500 °C with a heating rate of 1 °C/min and then holding the temperature at 500 °C for 2 h. The final Ni/C monoliths were black in color. The above procedure was followed to prepare rest of the monoliths with 2.5, 5 and 10 wt% Ni loading. Hierarchically porous monolithic carbon support (CN) without Ni loading was also synthesized for comparison by following the same procedure.