The Effect of hydrogen spillover on the hydrogenation of gluconic acid over physically diluted activated carbon supported Ru catalyst

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It is well-known that carbon support forming C-H bonds at the surface can spillover hydrogen through metal loaded as well as some metal oxide supports. We report the effect of hydrogen spillover on the hydrogenation of gluconic acid to sorbitol over activated carbon (AC) supported ruthenium catalyst. Hydrogen which was dissociated by ruthenium was spilled-over to AC and used as hydrogen resource on the hydrogenation of gluconic acid. Catalytic activity was increased by adding pristine AC via physical mixing and the effect of hydrogen spillover was enhanced at the lower reaction temperature. For comparison, other metal oxide supports (SiO_2, TiO_2, ZrO_2, and CeO_2) were mixed physically with Ru/AC and used on the hydrogenation reaction. The result indicates that the others except for SiO_2, which cannot spillover hydrogen, increased the yield of sorbitol slightly. Besides, the highest activity of AC support is relevant to the high adsorption capacity of AC which was confirmed from reaction intermediate and product (glucose and sorbitol) adsorption tests.