Pt-Catalyzed Chemoselective Hydrogenation of Dienes and Nitroarenes

Significance: An organoplatinum(IV) catalyst supported on Zn(II)-modified SiO₂ [(MeCp)PtH/Zn/SiO₂], prepared as shown in equation 1, catalyzed the semihydrogenation of buta-1,3-diene under H₂ to afford butenes in 86% conversion with 89% mono-olefin selectivity (eq. 2). The catalyst also promoted the chemoselective hydrogenation of nitrobenzenes bearing various reducible substituents, such as alkene, nitrile, or carbonyl groups, to afford the corresponding anilines in up to >99% conversion and up to >99% selectivity, with the substituents remaining intact (eq. 3).

Comment: The catalyst was characterized by means of solid-state NMR, XANES, EXAFS, PXRD, HR-TEM, TPR-H₂, NH₃-TPD, DRIFTS, DRUV-vis, and elemental analyses. In the hydrogenation of nitrobenzene, the catalyst was recovered by decantation and reused twice without loss of its catalytic activity.

Results:

- 1% 1,3-butadiene/Ar (18.75 ml/min)
- (MeCp)PtH/Zn/SiO₂ (80 mg)
- H₂ (50 psi), PhMe 40–75 °C, 24 h

- 86% conversion
- 89% mono-olefin selectivity

- 9 examples up to >99% conversion
- up to >99% selectivity