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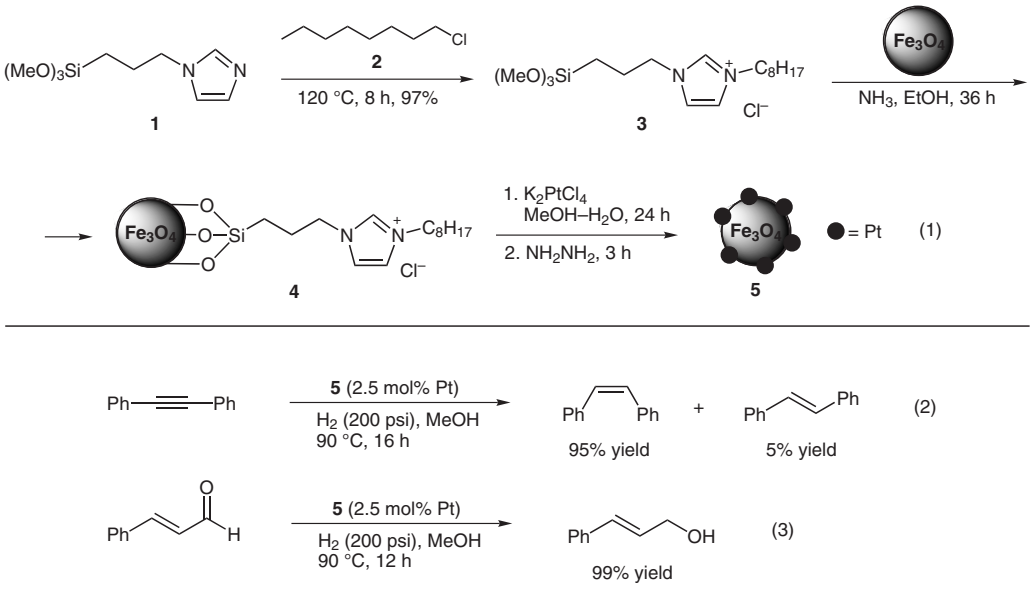
Platinum Nanoparticles Supported on Ionic Liquid-Modified Magnetic Nanoparticles: Selective Hydrogenation Catalysts

Adv. Synth. Catal. **2007**, *349*, 2145-2150.

Magnetic Nanoparticles-Supported Platinum Nanoparticles



Significance: Platinum nanoparticles supported by magnetic nanoparticles that were modified with ionic liquid were prepared and applied to the selective hydrogenation. Thus, imidazole **1** reacted with octyl chloride **2** at 120 °C to give the imidazolium chloride **3** in 97% yield (eq. 1). Treatment of **3** with the magnetic nanoparticles, Fe_3O_4, in the presence of ammonia afforded ionic liquid modified Fe_3O_4 **4**. Anion exchange reaction of **4** with K_2PtCl_4 followed by reduction with hydrazine provided the supported platinum nanoparticles **5**. The hydrogenation of diphenylacetylene was carried out in the presence of 2.5 mol% of catalyst **5** under 200 psi of hydrogen at 90 °C for 16 h to give *cis*-stilbene as a major product in 95% yield (eq. 2). Cinnamaldehyde was chemoselectively hydrogenated under similar reaction conditions to afford 3-phenylprop-2-en-1-ol in 99% yield (eq. 3).

Comment: The modification of Fe_3O_4 with ionic liquid is important for successful formation of the platinum nanoparticles on the surface of the magnetic nanoparticles. Without the modification with ionic liquid, the formation of platinum nanoparticles took place outside the surface of the magnetic support. In the selective hydrogenation of diphenylacetylene, the catalyst can be separated from the reaction mixture by an external magnet and reused four times without significant loss of catalytic activity (1st use: 100% conv., *cis*/*trans* = 95:5; 2nd use: 97% conv., *cis*/*trans* = 92:5; 3rd use: 99% conv., *cis*/*trans* = 93:6; 4th use: 97% conv., *cis*/*trans* = 93:4).

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Synfacts 2007, 12, 1321-1321 Published online: 22.11.2007
DOI: 10.1055/s-2007-991393; **Reg-No.:** Y12707SF

Category

Polymer-Supported Synthesis

Key words

platinum

magnetic nanoparticles

ionic liquids

hydrogenation