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Tuning the Chemoselective Hydrogenation of Nitrostyrenes Catalyzed by Ionic Liquid-Supported Platinum Nanoparticles

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Abstract

Pt nanoparticles (NPs) in the range of 1.7-3.4 nm were synthesized in an ionic liquid (IL). Subsequent immobilization on various solid supports (silica, alumina, titania, carbon nanotubes (CNTs)) in some cases proved to be beneficial. These catalysts exhibited excellent performance in the chemoselective hydrogenation of 3-nitrostyrene. The presence of the IL, the reaction medium (acidic or basic), and the type of support greatly influenced the catalytic behavior. Yields exceeding 90% to either 3-ethylnitrobenzene under acidic conditions or 3-aminostyrene under basic conditions could be achieved. The reaction proceeded smoothly at room temperature and 1 bar of hydrogen pressure with turnover frequencies in the range of 100 h⁻¹. The NP catalysts could be reused efficiently by supporting them either on SiO₂ or on CNTs. Comparison with IL-free catalysts indicated the principal influence of the IL on the selectivity.

Keywords

Author Keywords: platinum catalysis; chemoselective hydrogenation; ionic liquids; nitrostyrene; nitrobenzene; acid-base switch; carbon nanotubes; aniline derivatives

KeyWords Plus: SELECTIVE HYDROGENATION; FUNCTIONALIZED NITROARENES; SUBSTITUTED NITROAROMATICS; METAL NANOPARTICLES; NITRO-COMPOUNDS; GOLD CATALYSTS; REDUCTION; COMPLEXES; PD

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