

Continuous synthesis of TiO₂-supported noble metal NPs and their application in ammonia borane hydrolysis

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Abstract

A stabilizer-free method based on segmented flow for the continuous synthesis of TiO₂ supported noble metal nanoparticles (M/TiO₂-MR, M = Pd, Pt or Au) was proposed. Due to the enhanced mixing performance arising from the internal convection in the discrete plugs, the particle size of noble metal nanoparticles could be well controlled by reducing the metal precursors with NaBH₄ just in the presence of TiO₂ without using any stabilizer. In comparison with the batch method, the as-prepared M/TiO₂-MR had smaller noble metal particle size and better dispersity. Experimental results showed that adjusting the oil-to-water phase ratio or increasing the total volume flow rate and synthetic temperature could lead to smaller average particle size with narrower distribution. The as-prepared M/TiO₂-MR possessed higher catalytic activities in the hydrolysis of ammonia borane than those prepared by the batch method, which could be ascribed to smaller noble metal nanoparticles, exposing more active sites.

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