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PHOTODEPOSITION OF PT NANOPARTICLES ON Ce-Ti-O

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Hydrogenation reactions are the most common examples where transition and noble metal nanoparticles are applied in colloidal solution as quasihomogeneous catalysts [1]. The main drawback in the use of colloidal nanoparticles for catalysis concerns the recovery and reuse of these particles. This is especially important if environmental issues are considered. Therefore, attention has been drawn to the use of supported nanoparticles.

In this work, Ce-Ti-O supports were synthesized by the solvothermal method

using methanol and a cationic surfactant (CTAB). Pt nanoparticles were then supported by photochemical deposition using a low-pressure mercury lamp with an emission line at 254 nm (*ca*.3 W of radiant flux) during 4 h. The catalysts were calcined in N₂ (4 h, 100 mL min⁻¹), reduced in H₂ (2 h, 20 mL min⁻¹) and flushed again with N₂ during 30 min at 773 K.

Ultrafine platelet shaped CeO_2 particles with sizes ~ 3-8 nm were also produced by the solvothermal method. When Ti was combined with Ce, a nanostructured network was obtained. It was

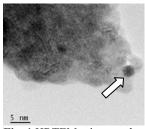


Fig. 1 HRTEM micrograph of Pt/Ce-Ti-O.

proved that Pt spherical nanoparticles (diameter ~ 2-4 nm) can be efficiently photodeposited on these supports. Fig.1 shows a HRTEM micrograph of the Pt/Ce-Ti-O catalyst, where a Pt nanoparticle (marked by an arrow) can be identified. These catalysts were tested in the selective hydrogenation of cinnamaldehyde to cinnamyl alcohol. Enhancement in the catalytic activity for cinnamyl alcohol production was observed with the Pt nanoparticles supported on Ce-Ti-O when compared with the single-oxide supports (CeO₂ and TiO₂).

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[1] C. Burda, X. Chen, R. Narayanan, M.A. El-Sayed. Chem. Rev 105 (2005) 1039.