

XXI Encontro Nacional SPQ

Química e Inovação

11 a 13 de Junho de 2008

Faculdade de Engenharia da Universidade do Porto



PHOTODEPOSITION OF PT NANOPARTICLES ON Ce-Ti-O

Adrián M. T. Silva^{a*}, Bruno F. Machado^a, Helder T. Gomes^{a,b}, José L. Figueiredo^a, Goran Drazic^c, Joaquim L. Faria^a

^aLaboratório de Catálise e Materiais (LCM), Laboratório Associado LSRE/LCM, Departamento de Engenharia Química, Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias s/n, 4200-465 Porto, Portugal

^bDepartamento de Tecnologia Química e Biológica, Escola Superior de Tecnologia e de Gestão do Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-857 Bragança, Portugal

^cJozef Stefan Institute, Department of Nanostructured Materials, Jamova 39, SI-1000 Ljubljana, Slovenia

*adrian@fe.up.pt

Hydrogenation reactions are the most common examples where transition and noble metal nanoparticles are applied in colloidal solution as quasi-homogeneous 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 CeO₂ 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 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 cinnamaldehyde hydrogenation and higher selectivity 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).

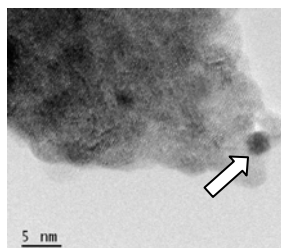


Fig. 1 HRTEM micrograph of Pt/Ce-Ti-O.

Acknowledgments: FCT (Portugal-Slovenia Cooperation in S&T 2008-2009; POCI/N010/2006; SFRH/BD/16565/2004).

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