

MECHANOCHEMICAL PREPARATION OF ADVANCED CATALYTICALLY ACTIVE BIFUNCTIONAL PD CONTAINING NANOMATERIALS FOR AQUEOUS PHASE HYDROGENATIONS

Majd Al-Najj^{a,b}, Alina M. Balu^b, Anca Roibu^a, Wolf -D. Eineke^a, Antonio A. Romero^b, Rafael Luque^b, Roger Gläser^a

^a*Institute of Chemical Technology, Universität Leipzig, 04103 Leipzig, Germany*

^b*Departamento de Química Orgánica, Universidad de Córdoba, Campus de Rabanales, Edificio Marie Curie (C-3), Ctra Nnal IV-A, Km 396, Córdoba, Spain*

Functionalized porous materials represent an important class of nanomaterials and a research area in which fascinating developments have been achieved in the past decade. One of current major challenges in the synthesis of mesoporous materials deals with the design and controlled preparation of a suitable pore structure with ideally various functions for improved activity and selectivity in catalysis as well as high stability for a range of versatile applications [1]. SBA-15 and Mesostructured cellular foam (MCF) silicas are known to provide such structures, however they are inert in catalysis and further functionalization is generally required to achieve catalytically active materials. The direct incorporation of metals in their structure can be achieved via isomorphic substitution of Si with Al [2]. The methods used for synthesis and stabilization of metal nanoparticles have been very diverse, ranging from standard methodologies including incipient wetness impregnation and co-precipitation to more innovative protocols such as ultrasound and microwave -assisted irradiation deposition.

In this work we present an alternative simple, fast and efficient method related to reactive milling (mechanochemistry)[3] for the preparation and stabilization of Pd nanoparticles over porous materials (SBA-15 type and MCF). Furthermore, the catalytic activity of the materials was assessed using the hydrogenation of p-nitrophenol (PNP) to p-aminophenol (PAP) using NaBH₄ as reducing agent in aqueous solution as a model reaction (Fig. 1).

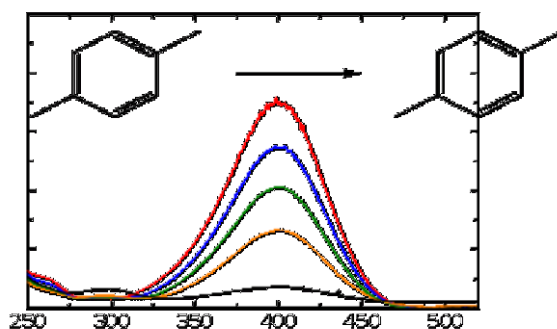


Fig. 1: UV/vis spectra to follow the progress of the hydrogenation of PNP to PAP over supported Pd catalysts.

[1] V. Salgueiriño-Maceira, M. A. Correa-Duarte, *Adv. Mater.*, 19 (2007) 4131.

[2] N. Linares, E. Serrano, M. Rico, A. M. Balu, E. Losada, R. Luque, J. García Martínez, *Chem. Commun.* 47 (2011) 9024.

[3] A. Pineda, A. M. Balu, J. M. Campelo, A. A. Romero, D. Carmona, F. Balas, J. Santamaria, R. Luque, *ChemSusChem* 4 (2010) 1561.