

Synthesis and Characterization of Mesoporous MCM-48 Containing TiO₂ Nanoparticles

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MCM-48 was used as the matrix for size-confined titania. Titanium was introduced into the pores of MCM-48 by wet impregnation using aqueous titanylacetylacetonate, TiO(acac)₂, or tetrabutyl orthotitanate in acetone solutions. Calcination in air led to the formation of titania. XRD, TEM, and adsorption investigations confirm the deposition of nanosized particles inside the pores of the mesoporous matrix without destroying their integrity. Chemical analyses show that the titania content increases after successive loading with 14 wt % of Ti after the third impregnation. The structure and size of the particles have been characterized with UV–vis, XANES, and EXAFS spectroscopies. The particle size is 2 nm after the first loading and increases after successive loading, finally showing more than one coordination environment, including resemblance with the structure of bulk rutile-TiO₂. Considering preferential occupation of the channel intersections, this leads to approximately 70% occupancy.