Structural Characterisation of Encapsulated Nanoparticles Inside Mesoporous MCM-48 with XRD, TEM and EXAFS

Bernd Marler, H. Gies, M. Bandyophadyay, O. Korsak, A. Birkner[a], K. V. Klementiev[b], M. W. E. van den Berg[b], W. Grünert[b], *Institut für Geologie, Mineralogie und Geophysik, [a]Lehrstuhl Physikalische Chemie I , [b]Lehrstuhl Technische Chemie, Ruhr-Universität Bochum, 44780 Bochum, Germany.* E-mail: bernd.marler@rub.de

Mesoporous silica-MCM-48 has been synthesized making use of the liquid crystal templating technique. In the as synthesized form the organic amphiphil occupies the pores of the silica framework. Because of the amorphous structure of silica in the framework wall, diffraction experiments only show the periodic order of the wall/pore system, i.e. the diffraction contrast, which has cubic symmetry and has been assigned to space group I a3d. Depending on the wall thickness and the periodicity of the silica framework diffraction signals only up to 8 °2θ for copper radiation can be observed. After calcination the pore space becomes open and accessible for sorbate molecules.

Using dip impregnation methods metal organic salts have been introduced inside the pore system of MCM-48 which is ca. 30Å in diameter. Subsequent calcination has transformed the salt into the oxide and furthermore, the oxides were reduced to the elementary metal. The contribution will discuss the structural characterization of ZnO, CuO, Cu, TiO_2, and Au deposited as nanoparticles inside the pore system using TEM, XAS, and PXRD and discuss their specific nature.

Keywords: mesoporous MCM-48, nanoparticles, EXAFS