Pseudomorphic transformation of SBA-15 and SBA-16

N. Zucchetto[1], D. Brühwiler[1]*

[1]ZHAW

Pseudomorphic transformation is an elegant way to alter the pore size of a mesoporous material without affecting its particle size and shape. This pathway uses a structure-directing agent (SDA) to rearrange the pore system of a porous material. Functional groups can be introduced during the transformation and the pore size can be adjusted to a certain degree by using differently sized SDAs. Mesoporous silica with bimodal pore size distributions were prepared by pseudomorphic transformation of SBA-15 and SBA-16 in the presence of hexadecyltrimethylammonium ions as a structure-directing agent. Partial pseudomorphic transformation was shown to alter the structure of the porous starting material from the outside to the inside, thus virtually creating a shell with a reduced pore size. The pH thereby governs the equilibrium between dissolution and reprecipitation of the silica matrix. Analysis of the products by gas sorption and small-angle X-ray scattering (SAXS) revealed hybrid pore structures, which featured – depending on the degree of transformation – variable contributions from the original and the newly introduced pore systems. This leads to the conclusion that the pore structure of the starting material significantly affects the outcome of the pseudomorphic transformation, thus opening possibilities for the synthesis of new porous materials with complex pore systems.