**Zeolite and MCM Nano- and Mesoporous Structures**

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Ordered micro- and mesoporous materials are well known for their catalytic and highly selective adsorbent properties. However they also offer a wealth of possibilities for creating materials with additional functionality.

Detailed X-ray diffraction interpretation of mesoporous materials is hampered by their large unit cell, the variable stacking and the limited crystal size. Electron microscopy combined with electron diffraction is therefore a more powerful technique to determine the structure of mesoporous materials on a local scale.

A crystalline silica material "Zeotile", with two levels of porosity and a clear structural order can be produced by tiling nanoslabs with the Silicalite-1 structure type. They can be tiled in various ways into materials with a well-defined mesoporosity. Microscopy of Zeotile-1 shows two types of pores: hexagonal and triangular with sides of 2.0 nm and 2.6 nm, respectively. In Zeotile-1, nanoslabs are forced into face sharing, double units, and then linked to form a pattern with hexagonal symmetry. Zeotile-2 is built from very similar (double) units as Zeotile-1, but has a body centred cubic symmetry (SG $Ia\bar{3}d$). Hexagonal MCM-41 can be turned into cubic MCM-48 and finally into spherical particles (SSP) by the addition of alcohol to the synthesis of a mesoporous silica material. XRD suggests that the structure of these spherical particles is of the MCM-41 type. However, TEM reveals that the structure of mesoporous SSP consists of a core in the form of a truncated octahedron with the MCM-48 cubic structure and radial pores grown on the surfaces of the truncated octahedron. Spherical MCM particles therefore have a mixture of cubic and hexagonally arranged pores.

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