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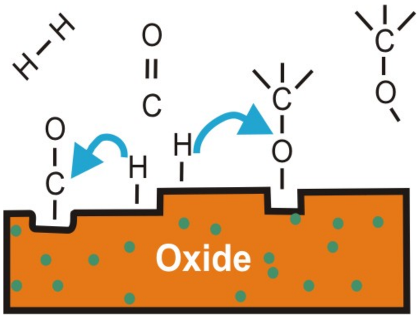

SFB 558
„Metall-Substrat-Wechselwirkungen in der heterogenen Katalyse“

Einladung
zum Vortrag von

Dr. O. I. Lebedev

EMAT, Physics Department, University of Antwerp, Antwerpen, Belgium
(Gast von Prof. Fischer)

„Crystalline and Amorphous Frameworks with Giant Pores: What Information Can We Expect from TEM?”

Three main categories of porous solids have been reported: (i) inorganic crystalline microporous solids (zeolite, metalophosphates), (ii) inorganic mesoporous solids with amorphous walls and a mesoscopic periodicity and (iii) nanoporous metal-organic-frameworks (MOFs) which are built up from an assembly of inorganic building blocks and organic moieties (carboxylates, phosphonates...). Transmission electron microscopy (TEM) has been successfully used to obtain structural information. In the case of zeolites, the technique allows structure identification and space group determination of poorly crystallized porous solids. The structure of a new type of crystalline silica material “Zeotile”, produced by tiling zeolite nanoslabs, has been determined by TEM [1]. 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 [2,3]. TEM reveals the complex structure of the SSP [4]. Its structure 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. A new macro/mesoporous silica ordered material with a narrow pore size distribution and high crystallinity based on SSP has been prepared by a hydrothermal merging process. Materials are characterized by complimentary techniques such as X-ray diffraction, nitrogen adsorption, scanning and transmission electron microscopy. The analyses show that new nanostructures, based on SSP with a dual macro/mesoporosity (duplet, triplet, quadruplet , chain-like structure), can be successfully synthesized.

Recently, a general approach for direct structure determination of the mesoporous materials by TEM has been reported. This method would not work for MOFs due to their much lower thermal stability. However, it will report the first direct imaging by TEM, together with the structure characterization by electron diffraction of a giant MOF material (chromium terephthalate MIL-101 and MOF-5). This porous material presents several unprecedented features: a zeotype cubic structure, a giant cell volume, a hierarchy of extra-large pore sizes, and a record sorption capacity [5].

References

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Gäste sind herzlich willkommen.