Donnerstag 4. Februar 2016
16:15 Uhr, Hörsaal H3

Heterogeneous Catalysis in Nanopores: The Benefit of Hierarchical Pore Systems

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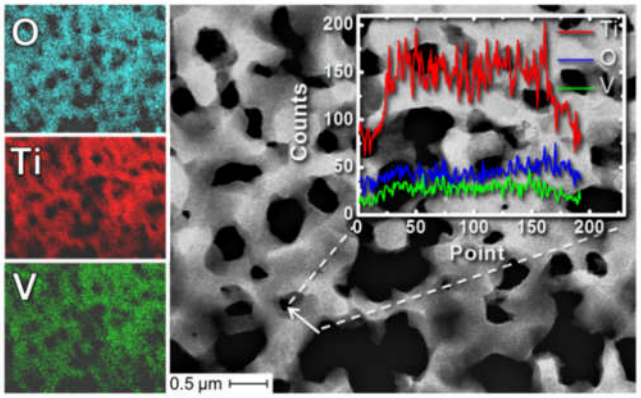

Figure 1. STEM of a hierarchical meso-/macroporous vanadia/titania sample (gray background, right). EDX-mapping of the same view (left; oxygen (blue), titanium (red) and vanadium (green)). The inserted graph (top right) shows the local elemental scanning.

Nanoporous catalysts are applied in a broad range of chemical conversions. Often, the high specific surface area and the confined pore space are utilized to achieve high activity and selectivity. However, low catalyst effectiveness factors may result, if mass-transfer limitations exist, e.g., due to large substrate molecules. Additional pore systems with larger dimensions in the macro- and mesoporous range may, thus, help to increase accessibility and mass-transfer to and away from the catalytically active sites within nanoporous catalysts. This presentation will highlight two examples of nanoporous catalytic systems demonstrating the beneficial effect of an additional system with larger pores. In the first example, titanium silicalite-1 (TS-1)-based catalysts with an additional mesopore systems are applied for the epoxidation of fatty acid methyl esters (FAME) with hydrogen peroxide in the liquid phase. The second example deals with the selective catalytic reduction of NO_x over monolithic mixed oxide V_2O_5/TiO_2-catalysts (Figure 1). The results provide experimental proof for increased reaction rates in the presence of a combined meso-/macropore system over a purely mesoporous catalyst.

n the first part of the talk, the merits of tailored nanoparticles synthesised bottom-up in dispersions will be presented, followed by giving a flavour on the challenges to upscale and process small (nano)particle suspensions.

In the second part of the talk, focus will be put on magnetic nanoparticles and composite particles made thereof. It will be shown how magnetic properties can be tailored from different synthesis approaches and how further modification and processing of magnetic nanoparticle-building blocks to more complex structures yields new composite particles with interesting properties and application potential.

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