Title: Exploring the Complexity of Pore Space of a Catalyst Particle

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The efficiencies and selectivities of heterogeneous catalysts could be dramatically improved by rational catalyst design. One of the prerequisites for this is a better understanding of the diffusion processes in hierarchical porous structures. Thanks to recent advances in single particle tracking (SPT), it is now possible to track single molecules with sub-diffraction-limit-precision as they move through porous bodies. However, the pore space of real-life catalysts is highly complex and it involves length scales from the nano-level (< 2nm) to fractions of a millimetre. Therefore, many aspects of the mass transfer processes inside them are still poorly understood. This problem can be addressed by studying diffusion in well-defined model-structures. By using state-of-the-art 3D printing technology, we will be able to design porous systems that mimic those of catalyst particles with increasing levels of complexity and follow diffusion probes as they travel across them. Then, comparing our results to simulations as well as SPT experiments on real catalyst particles will allow us to unravel some of the mysteries of mass transfer inside heterogeneous catalysts.