

Diffusion in mesoporous zeolites

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The performance of nanoporous materials during their application in heterogeneous catalysis and mass separation is often controlled by their transport properties. This is especially true concerning microporous host systems such as zeolites. Today, the purposeful synthesis of “hierarchical” nanoporous materials, i.e. materials containing both micro- and mesoporous regions, offers the opportunity of promoting the rate of molecular transport by the presence of mesopores. At the same time, the functionality of the material is preserved owing to the contents of micropores. The incorporation of mesopores into microporous materials, however, does not automatically lead to transport-promoted nanoporous materials. Understanding of this phenomenon is, therefore, of immediate importance, but is still precluded by the lack of systematic experimental studies of transport properties in such hierarchical pore systems. In this contribution, we present the results of pulsed field gradient NMR study of diffusion process in LTA-type zeolites synthesized to include a given amount of mesopores in the range from 0 to 5 volume percents. We discuss different mechanisms determining mass transfer in these materials and make some conclusions on the design of most efficient pore systems.

References

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