Insights into the Adsorption- and Phase Behaviour of Fluids in Nanoporous Materials: *Towards an Advanced Textural and Surface Characterization*

Prof. Dr. Matthias Thommes

Institute of Separation Science & Technology
Department of Chemical and Biological Engineering
Friedrich-Alexander University, Erlangen-Nürnberg /FAU)

Nanoporous materials (e.g. carbons, zeolites, metal organic framework materials, ordered and hierarchically structured meso-macroporous oxides etc.) have been the subject of extensive research targeted towards a wide range of applications because of their unique textural properties (e.g., increased surface area and the ability to customize the pore size and pore size distribution). In addition, unique nano-confinement effects including shifts in the phase diagram of pore fluids and altered thermophysical properties can be observed. In order to utilize effects of nano-confinement in various application areas (e.g., separation, catalysis, gas-energy storage) a detailed understanding of the interplay between effective fluid-fluid and fluid-(pore) wall interactions on the one hand and the effects of confined pore space and pore geometry/pore network on the other hand is required.
Within this context, we discuss important aspects associated with the adsorption-, phase- and wetting behavior of fluids in nanoporous materials and link these with recent advances in the development and application of advanced and novel adsorption methodologies for assessing key aspects of (i) their pore network characteristics (e.g., pore connectivity, characteristic parameters correlated with of pore network disorder/restrictions), and (ii) pore surface properties (e.g., hydrophobicity/hydrophilicity).