Physical adsorption: A powerful tool for the advanced textural characterization of nanoporous materials

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Significant progress has been achieved during the last 25 year with regard to the understanding of the adsorption and phase behaviour of fluids in narrow pores mainly because of the following reasons: (i) the discovery of nanoporous materials which exhibit a uniform pore structure and morphology and can therefore be used as model adsorbents to test theories of gas adsorption;(ii) the development of microscopic methods based on density functional theory (DFT) or molecular simulation which allow one to describe the configuration of adsorbed molecules in pores on a molecular level; (iii) advances in experimental methodology.

It is now possible to utilize physical adsorption to accurately determine pore size/volume distributions of ordered nanoporous materials but also to characterize materials which exhibit complex, but well defined pore structures. Major challenges still exist concerning the surface and pore size characterization of heterogeneous/disordered and non-rigid porous materials.