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«INSIGHTS INTO THE ADSORPTION AND PHASE BEHAVIOUR OF FLUIDS IN NANOPOROUS MATERIALS WITH HIERARCHICAL PORE STRUCTURE: TOWARDS AN ADVANCED TEXTURAL CHARACTERIZATION»

par le Dr. Matthias THOMMES
Director for Applied Science at Quantachrome Instrument, USA
Professor@Lorraine

Le jeudi 7 septembre 2017 à 10h30, Amphithéâtre Philippe Séguin, ENSTIB - Epinal


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Insights into the Adsorption and Phase Behaviour of Fluids in Nanoporous Materials with Hierarchical Pore Structure: Towards an Advanced Textural Characterization

by **Dr Matthias Thommes**

Director for Applied Science at Quantachrome Instrument, USA

Professor@Lorraine

In recent years, major synthetic efforts have been focused on the introduction of hierarchical pore structures into many different materials such as zeolites, carbons, silicas, MOFs, hybrid layered and pillared structures. Nanoporous materials which consist of hierarchical pore networks with pore widths spanning the entire micro-mesopore range (i.e. up to 50 nm) allow one to overcome accessibility and diffusion limitations associated with classical microporous materials for catalysis and separations.

In this talk recent developments in the structural characterization of these materials will be described. An accurate textural characterization is crucial not only within the discovery process of novel hierarchically ordered nanoporous materials but also contributes to advance their application in a variety of areas including heterogenous catalysis, separation, battery devices, drug delivery. Among a variety of techniques, gas adsorption is widely applied because it assesses a wide range of pore sizes, spanning the entire micro- and mesopore range. Within the last two decades major progress has been achieved in physical adsorption characterization also because of the development of advanced approaches based on statistical mechanics such as molecular simulation and density functional theory (DFT). This progress, coupled with the availability of high resolution experimental methodologies for the adsorption of various subcritical fluids (also allowing one to couple adsorption techniques with complimentary techniques such as small angle scattering), has led to major advances in the structural characterization of nanoporous materials [1]. However, major challenges still exist concerning an in-depth characterization of complex pore networks. Application of characterization techniques to hierarchical materials has revealed new phenomena, such as cavitation processes during desorption, and led to significant refinement of these techniques [2].

[1] M. Thommes, K. Kaneko, A.V. Neimark, J.P. Olivier, F. Rodriguez Reinoso, J. Rouquerol and K.S.W Sing, (IUPAC Technical Report), Pure Appl. Chem. 87, 1051 (2015)

[2] K. A. Cychosz, R. Guillet-Nicolas, J. Garcia-Martinez, J., M. Thommes, M. Chem. Soc. Rev. 46, 389, (2017)