SMALL-ANGLE SCATTERING IN POROUS MATERIALS: A REVIEW HIGHLIGHTING DATA ANALYSIS CHALLENGES

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Countless technologies and chemical processes make use of nanoporous materials: heterogeneous catalysis, including electrochemical reactions in fuel-cell electrodes, adsorption separation processes, kinetically selective membrane processes, are but a few examples. Nanopores are also relevant to natural processes as diverse as the weathering of rocks and ion transport through biological membranes.[1] Small-angle scattering of x-rays (SAXS) or neutrons (SANS) is one of the few experimental methods currently available for the in situ analysis of phenomena in this type of materials at the mesoscopic scale.[e.g. 2,3]

In this presentation, we briefly review some recent applications of small-angle scattering to the in situ analysis of phenomena inside mesoporous solids. A particular focus is put on the data analysis challenges, whereby the scattered intensity is converted to real-space structures with nanometer resolution.

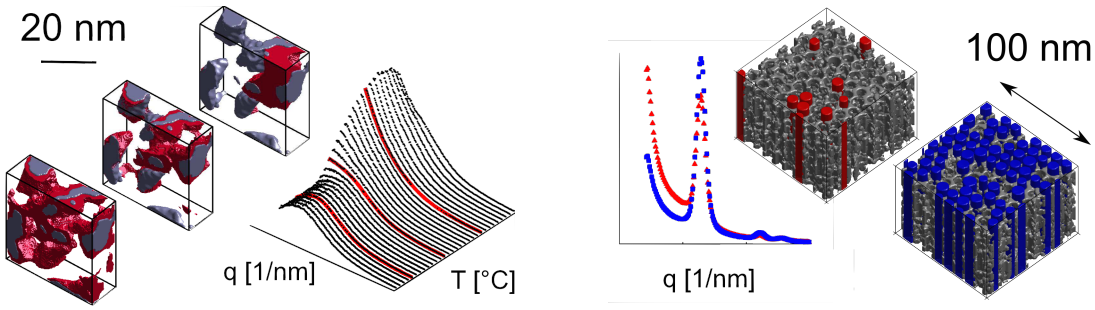

Figure 1. Examples of porous nanostructures reconstructed from small-angle scattering data. Left: temperature-dependent morphology of confined nitrobenzene [3]; Right: metal loading in copper catalysts supported on silica, displaying mesoscale heterogeneity [4].

[1] O. Coussy, *Mechanics and Physics of Porous Solids*, Wiley, 2010.

[2] P. Huber, *J. Phys.: Condens. Matter* 27 (2015) 103102.

[3] C.J. Gommes, *J. Appl. Cryst.* (2013) 493.

[4] C.J. Gommes, G. Prieto, J. Zecevic, M. Vanhalle, B. Goderis, K.P. de Jong, P.E. de Jongh, *in preparation*.

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