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. 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.

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; Right: metal loading in copper catalysts supported on silica, displaying mesoscale heterogeneity.


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