

Characterizing the structure of nanoporous materials is key to understanding both their macroscopic properties and the physicochemical processes involved in their formation. Electron microscopy can provide direct and detailed structural information, but the sampling is extremely poor. The mass of material imaged in, say, a transmission electron micrograph is typically in the femtogram range. Therefore, it is useful to complement microscopy with bulk characterization techniques, which provide nanometer-scale structural information based on macroscopic measurements. The present course focuses on three such techniques, which are commonly used to characterize nanoporous materials, namely: mercury intrusion porosimetry, gas adsorption/desorption measurements and small-angle scattering of either x-rays (SAXS) or neutrons (SANS). The course touches on the physics underlying each technique, and illustrates their potential and limitations with examples. The specific challenges posed by aerogels are also discussed. Globally, each technique provides incomplete and complementary pieces of information, which have to be creatively combined into a coherent description of the porous structure. Structural models play an important role in that process.