Review

Progress in the Physisorption Characterization of Nanoporous Gas Storage Materials

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Progress in the Physisorption Characterization of Nanoporous Gas Storage Materials

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ABSTRACT

Assessing the adsorption properties of nanoporous materials and determining their structural characterization is critical for progressing the use of such materials for many applications, including gas storage. Gas adsorption can be used for this characterization because it assesses a broad range of pore sizes, from micropore to mesopore. In the past 20 years, key developments have been achieved both in the knowledge of the adsorption and phase behavior of fluids in ordered nanoporous materials and in the creation and advancement of state-of-the-art approaches based on statistical mechanics, such as molecular simulation and density functional theory. Together with high-resolution experimental procedures for the adsorption of subcritical and supercritical fluids, this has led to significant advances in physical adsorption textural characterization. In this short, selective review paper, we discuss a few important and central features of the underlying adsorption mechanisms of fluids in a variety of nanoporous materials with well-defined pore structure. The significance of these features for advancing physical adsorption characterization and gas storage applications is also discussed.

1. Introduction

Superior materials for gas storage have become increasingly sought after, and porous materials offer attractive solutions for storage applications such as carbon capture and sequestration or methane (CH_4) and hydrogen (H_2) storage