Gas adsorption properties of fluorinated single-walled carbon nanotubes

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Single-walled carbon nanotubes (SWCNTs) have great attention for fundamental research subjects and potential applications because of their unique structural, chemical, and physical properties. In recent years, there has still been an extensive effort to induce more attractive chemical and physical properties of SWCNTs. In particular, the adsorption properties of SWCNTs have been actively studied for application to gas and energy storage [1-4]. Chemical modifications of SWCNTs are effective way to control their adsorption properties and can offer many opportunities for the development of novel functionalities. Herein, the SWNTs were modified by fluorination to form more attractive nanotubes that have characteristic structural and adsorptive properties [5]. The SWNTs were fluorinated in the temperature range from 298 to 473 K using elemental F_2 and their adsorption properties were investigated by using N_2 and CO_2 gases. The phenomenon of low-pressure adsorption and desorption hysteresis was observed on the CO_2 adsorption/desorption isotherms of pristine and fluorinated SWNTs. A remarkable adsorption/desorption hysteresis may be attributed to restricted access to the inside pores of nanotubes through the opened gates. Diffusional limitations by pore blocking effects are discussed as the origin of the hysteresis. The low-pressure hysteresis might give an idea of the adsorption in the fluorinated pores, which is important information for gas separation technology.

References

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