COMPARISON OF NITROGEN AND ARGON PHYSISORPTION APPLIED TO FAUJASITE ZEOLITE

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N_2 physisorption at 77 K is commonly used to determine the specific surface area (BET), micro- and meso-pore volume, and pore size distribution. However, for microporous materials, measurement using N_2 physisorption has limitations and may be inaccurate. For microporous materials, such as activated carbon or zeolite, there has been a recent trend toward determining textural properties by Ar adsorption at 87 K. However, the measurement of Ar adsorption in liquid Ar is very costly and therefore the more affordable liquid N_2 is used instead of liquid Ar. For this type of measurement, special accessories are used to raise and maintain the boiling temperature of liquid Ar (87 K), such as CryoTune (3P Instruments) or CryoSync (Quantachrome). In this work, the adsorption of N_2 at 77 K and the adsorption of Ar at 87 K were compared in faujasite (FAU) zeolite. The temperature for both adsorptions was maintained using liquid nitrogen. CryoTune was used to achieve the boiling temperature of liquid Ar (87 K). The samples were degassed at 300 °C and measured on an Aurosorb iQ physisorption instrument. Our measurements showed significant differences between adsorption of N_2 at 77 K and the adsorption of Ar at 87 K in FAU zeolite. Furthermore, in contrast to the N_2 physisorption at 77 K, measurements using Ar at 87 K resulted in the filling of narrow pores at higher pressures, which brought considerable advantages with it. Another difference was observed in the specific surface area and in the total analysis time. The method of Ar adsorption at 87 K proved to be more suitable for this type of material than the N_2 adsorption at 77 K.

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