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Influence of pore dimensions of materials on humidity self-regulating performances

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Abstract

A humidity self-regulating material has been developed so as to improve the residential comfort level and save energy of buildings, and pore dimension of materials was found to condition the humidity regulating capability mainly. In order to confirm the effect of pore dimension of materials on humidity regulating, the silica-based materials with different pore sizes from 3.5nm to 10.9 nm were synthesized and further used to measure the physical adsorption/desorption capabilities of water vapor. Experimental results showed that an effective humidity self-regulating performance of materials did depend closely on their pore dimensions (3.5nm~7.1nm in this study). Finer pores had a better capability of self-regulating humidity, but the too small pores (<3.7nm) resulted in a minus influence on the humidity regulating property. The adsorption/desorption water vapor capability reduced quickly with increasing pore size from 4.2nm to 7.1nm, and above 7.1nm the materials almost lost the humidity self-regulating capability.

Key Words

Porous materials; Pore dimension; Relative humidity; Mesoporous; Functional; Humidity-regulating.

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