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The NMR study of pore connectivity

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Abstract

A new method to study the pore connectivity of meso- and macrporous materials was proposed. The dependence of the melting temperature of a frozen liquid in a pore on its size was used to single out the pores of a given size in a sample and to estimate the pore size. The sample was heated after preliminary freezing of a liquid (adsorbate) that was introduced into sample pores. Adsorbate melts in pores with smaller (than definite) sizes. The state of adsorbate was controlled by the data on NMR relaxation; the pore connectivity was determined by the data on self-diffusion of liquid molecules in selected pores studied by the pulse field gradient (PFG) NMR method. The applicability of the method of the estimation of pore sizes was considered using the mesoporous carbonaceous adsorbent-cyclohexane system, and that of the method of studying pore connectivity using the anhydrous cement-cyclohexane system as examples.