

## Effect of a porous medium on the phase transitions and mobility of cyclohexane molecules

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### Abstract

The effect of a porous medium on the phase transitions and molecular mobility of cyclohexane at a liquid content corresponding to a monolayer is studied by pulsed NMR. The times of longitudinal  $T_1$  and transverse  $T_2$  magnetic relaxation of protons of cyclohexane introduced into granulated porous glasses of the Vycor type with average pore diameters of 4, 11, and 32 nm are measured in the temperature range of 128-293 K. In spite of a relatively low liquid content, two phase transitions are observed for all porous glass samples at temperatures lower than those inherent in pure cyclohexane. At low temperatures, nonfreezing cyclohexane volumes with characteristic times of  $T_2 \sim 100-200 \mu\text{s}$  and relative populations of 5-10% remain preserved due to the presence of a small number of micropores commensurable with molecular sizes. The appearance of an additional component with  $T_2 \sim 200 \mu\text{s}$  upon temperature elevation to 148 K attests to thawing out of some cyclohexane volumes, which begins long before the crystal-plastic crystal phase transition. The nonexponential character of the transverse magnetization decay of cyclohexane above the temperature of the plastic crystal-liquid phase transition in the porous glass with a pore diameter of 4 nm suggests the existence of barriers for rapid molecular exchange. The obtained experimental results are indicative of the cluster mechanism of cyclohexane adsorption in the studied porous glasses. © 2009 Pleiades Publishing, Ltd.

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