Colloid Journal 2005 vol.67 N6, pages 746-750

NMR study of the kinetics of butane and hexane adsorption from vapor phase by porous glasses

Pimenov G., Skirda V.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The kinetics of butane and hexane sorption from vapor phase by porous glasses is studied by the pulsed NMR technique. The sorption process is revealed to proceed in two stages: monomolecular adsorption and capillary condensation. The rate of adsorption is limited by the rate of adsorbate transfer to the adsorbent surface, with the latter rate being described by the classical diffusion flux. It is shown that ultramicropores are filled simultaneously with the formation of a monolayer. The relative content of molecules in such pores is estimated. At the stage of monomolecular adsorption and at the initial stage of capillary condensation, when the adsorption proceeds from the vapor phase of butane-hexane or butane-deuterated hexane mixtures, butane molecules are predominantly sorbed and followed by their partial displacement by hexane molecules. The rate of the capillary condensation of butane from the mixture is 15-18-fold lower than that from the vapor phase of butane alone which is explained by a decrease in the gradient of chemical potential. It is shown that, when adsorption occurs from a nonequilibrium butane-hexane mixture, anomalous kinetic curves are observed because the driving force of adsorption changes in the course of establishing equilibrium in the liquid phase.

http://dx.doi.org/10.1007/s10595-005-0158-5