

Vapor sorption isotherm by different biopolymers and polymers

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The basic purpose of the given work is determination of uniform isotherm, allowing to describe process of sorption vapor by the biopolymers and polymers. The cluster model of vapor sorption by polymers and biopolymers is offered. The key features of this model are: 1. In glassy polymer there are two different types of sorption sites. Sites of the first type are located in the equilibrium matrix region of the glassy polymers and do not contain the active adsorption centers of the polymer. The sites of second type are located in the non-equilibrium unrelaxed, molecular-scale gaps (microvoids) frozen into the glassy state. Each microvoid contains the active adsorption center. 2. Kinetics of adsorption is limited by the rate of forming of clusters from the penetrant molecules. Two types of dynamic clusters are formed in the process of reversible kinetics of vapor sorption by glassy polymer. Cluster of the first type is an aggregate of sorption sites of the first type with one penetrant molecule on the each site. Cluster of the second type is formed in microvoid. Penetrant molecule adsorbs on the active adsorption center of microvoid to form secondary adsorption center, on which the cluster from molecules of the penetrant will be formed. 3. The clusters of both types can both aggregate and fragment. The systems of the equations describing kinetics of reversible sorption in each of types of sites are received. The physico-chemical significances of basic parameters of the sorption system are analyzed. Analytical expression for a vapour sorption isotherm by polymers and biopolymers is received. This work was supported by the Russian Foundation for Basic Research (project no. 08-08-00832-a)