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Kinetics adsorption of 4,4-dimethyl-1,3-dioxane from aqueous solutions by carbon porous materials in the presence of phosphoric acid

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Abstract

One of the basic method of producing isoprene in the industry is "dioxane method" based on the thermal catalytic decomposition of 4,4-dimethyl-1,3-dioxane, which is synthesized in the first step by reaction of isobutylene Prins condensation with formaldehyde in the presence of phosphoric acid.

The advantage of this method is the high purity of the resulting isoprene (piperylene absence of impurities) and small energy consumption. However, a significant disadvantage of this method is the low selectivity of the process in the first stage – the formation of by-products (hydrogenated pyrans and etc.).

Some examples show that one of the most promising ways to enhance selectivity formation of 4,4-dimethyl-1,3-dioxane is to use heterogeneous porous media. However, these studies were not considered particularly interaction of reactants and products Prins reaction with porous materials.

In this paper we studied the kinetics adsorption of 4,4-dimethyl-1,3-dioxane on porous carbon nanotubes and glassy carbon from aqueous solutions in the presence of phosphoric acid. The values of the external and internal mass transfer diffusion coefficients were obtained. We found the influence of the contribution of external mass transfer and internal diffusion on the process of 4,4-dimethyl-1,3-dioxane adsorption. The time of establishment of sorption equilibrium was determined.

We have found that 4,4-dimethyl-1,3-dioxane adsorption process as for a carbon nanotube and for a glassy carbon from the aqueous solution in the presence of phosphoric acid has been determined by influence of the external mass transfer and internal diffusion. It is shown that time of achievement equilibrium sorption for a carbon nanotube, and for a glassy carbon is 600 s.

References

[1] N.A. Plate, E.V. Slivinskii. The Basics of chemistry and monomers technologies. *M: Nayka.* **2002**. 696p. (russian)
[2] S.N. Telalović, J.F. Maheswari, R. Ramanathan, A. Chuah, U. Hanefeld. Synergy between Bronsted acid sites and Lewis acid sites. *Chemical communications (Cambridge, England).* **2008**. Vol.7345. No.38. P.4631.
[3] V.A. Kraikin, A.E. Egorov, S.N. Salazkin. Synthesis polyarylenephthalides promising as smart polymers. *International Polymer Science and Technology*. **2008**. No.4. P.17.
[4] V.A. Kraikin, Z.N. Musina, E.G. Galkin, S.I. Kuznetsov, A.E. Egorov, S.N. Salazkin. Degradation of poly(terphenylenephthalide) at high temperatures. *Polymer Science U.S.S.R.* **2006**. A. Vol.48. No.11. P.2159.
[5] B.V. Aivazov. The Basics of Gas Chromatography. *Moscow: Vyshay Shkola.* **1977**. 182p. (russian)
[6] T.A. Krasnova, N.S. Golybeva, O.V. Belyaeva. Extraction of phenol from organo-minerals mixtures. *Actual Problems of Modern Science.* **2006**. No.4. P.143-146. (russian)