INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGIES
www.journalsresearchparks.org/index.php/IJOT e- ISSN: 2615-8140|p-ISSN: 2615-7071
Volume: 03 Issue: 05 | May 2021

Mechanism of Interaction of Adsorbent and Adsorbate

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ABSTRACT

Adsorption refining was carried out in the laboratory to determine the equilibrium time of the "oil-adsorbent" in a heterogeneous system. whitewashing process in activated Askamar bentonite (1) When carried out at 70 0 C, the chlorophyll content of the oil was absorbed at a rate of 0.2 mmol / g for up to 30 min, after which this value remained unchanged, as well as in Pakistan bentonite obtained for control, this value was 0.22 mmol / g.

Keywords: Askamar bentonite, Adsorption refining, adsorbate, gossypol, equilibrium time.

Introduction

Substantiation of the following scientific solutions for the production and application in practice of activated adsorbents from natural bentonites in the world today, including: selection of suitable raw materials for the production of adsorbents with selective absorption properties; study of thermodynamics of adsorption of water and organic vapor on natural and activated bentonites; study of the laws of influence of exchangeable cations on adsorption processes; study of the mechanism of complete molecular adsorption; it is necessary to determine the areas of application of activated bentonites in industry[1].

Clay minerals include naturally occurring layered and layered chain silicates, mainly the chemical decomposition of rocks, the accumulation of sediments, as well as the possibility of adding layers formed during their post-sedimentary transformation, including hydrothermal action or other methods [1]. One of the important features of the crystal structure of clay minerals is their active interaction with water. The tetrahedral and octahedral layers are arranged in such a way that the apex of the tetrahedrons of each silica structure forms a common layer with the ON-group of the octahedral layer. The alumina structure is located between two silica layers.

In adsorption refining, the adsorbent is sorbed at different rates depending on the nature, size and polarity of the absorbed substance. Hence, it is important to study their adsorption kinetics.

Main part

Adsorption refining was carried out in the laboratory to determine the equilibrium time of the "oil-adsorbent" in a heterogeneous system. [2]. In this case, the amount of adsorbent obtained above was 2%. Optimal conditions of the process are at a temperature of 70-800 C, which allows to keep the oxidation rate at the lowest level. After the adsorption refining process, the oil is filtered to determine the amount of coloring additives in it[2].

We use the following formula to determine the efficiency of the adsorption process: [3]

$$A=\frac{C_{адсорб}-C_{т}}{m}$$; mol / g

$C_{даст}$ - the adsorbent concentration in the original oil;

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C_τ- the adsorbent concentration after a certain t-time after the start of the process;

m- adsorbent mass.

The adsorption kinetic lines of the obtained samples are shown in Figure 1 below.

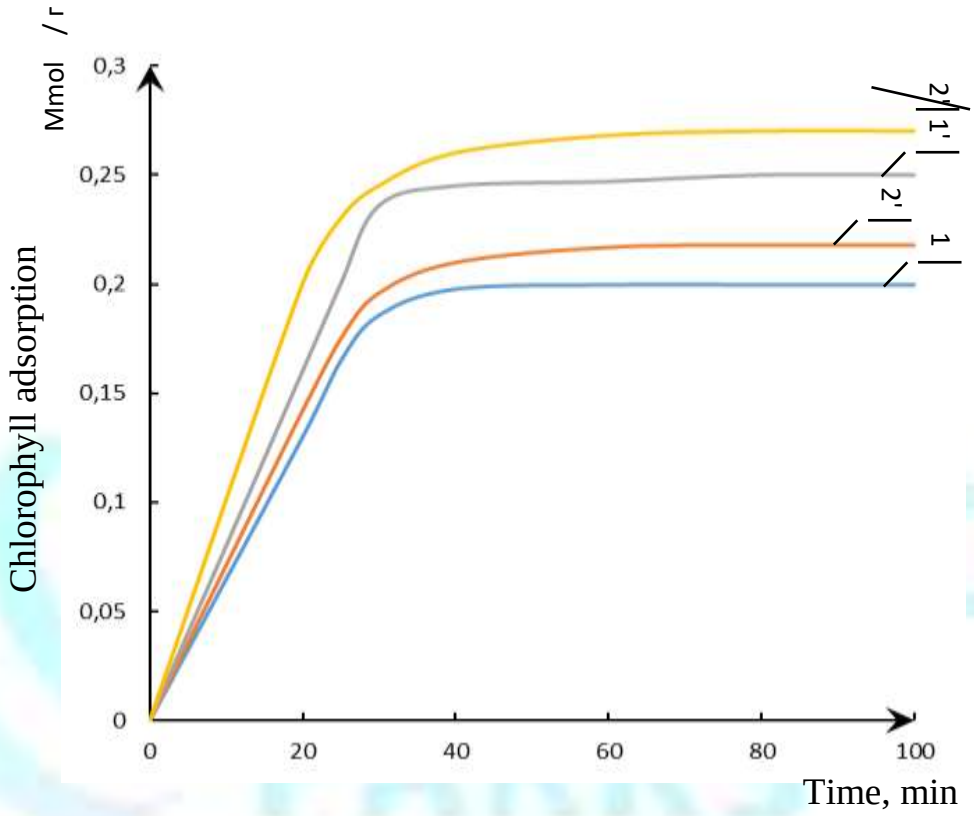

Figure 1. 1 - Askamar - 70 ° C; 2- Pakistan - 70 ° C;

1'- Askamar - 90 ° C; 2'- Pakistan - 90 ° C

The equilibrium time for the adsorbents studied from the given figure varies with the adsorption temperature. Figure 1 shows that when the bleaching process in activated Askamar bentonite (1) is carried out at 70 0 C, the chlorophyll in the oil is absorbed at a rate of 0.2 mmol / g for up to 30 minutes, after which this value remains unchanged. in bentonite, this figure was 0.22 mmol / g. Hence, our obtained adsorbent proved once again that it does not lag behind imported Pakistani bentonite. Now, as a result of raising the temperature of the bleaching process to 80 0 C, the chlorophyll in the oil is absorbed at a rate of 0.25 mmol / g for up to 30 minutes, after which this value remains unchanged. did. This can be understood as a result of a significant reduction in equilibrium time as a result of the increase in temperature, i.e., a decrease in viscosity and an acceleration of the mass transfer process.

The equilibration time of the adsorbent - adsorbate - was 30-40 minutes for Askamar bentonite. This subsequent change in time indicates

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that the adsorbent is not absorbed at all, i.e. it is saturated.

The specific gossypol and its derivatives, which are not present in other oils of cottonseed oil, lower the quality indicators. Therefore, it is necessary to clean them using adsorbent adsorbents. Their time and temperature dependence kinetics were studied. This is shown in the figure below[5].

As can be seen from the graph in Figure 2, we can see that the amount of gossypol varies from 0.7 mmol / g to 1.0 mmol / g with increasing temperature. In this graph, too, we can see that Askamar bentonite, which activates gossypol, is not inferior to Pakistani bentonite. So we can recommend our activated Askamar bentonite for the bleaching process of cottonseed oil[6].

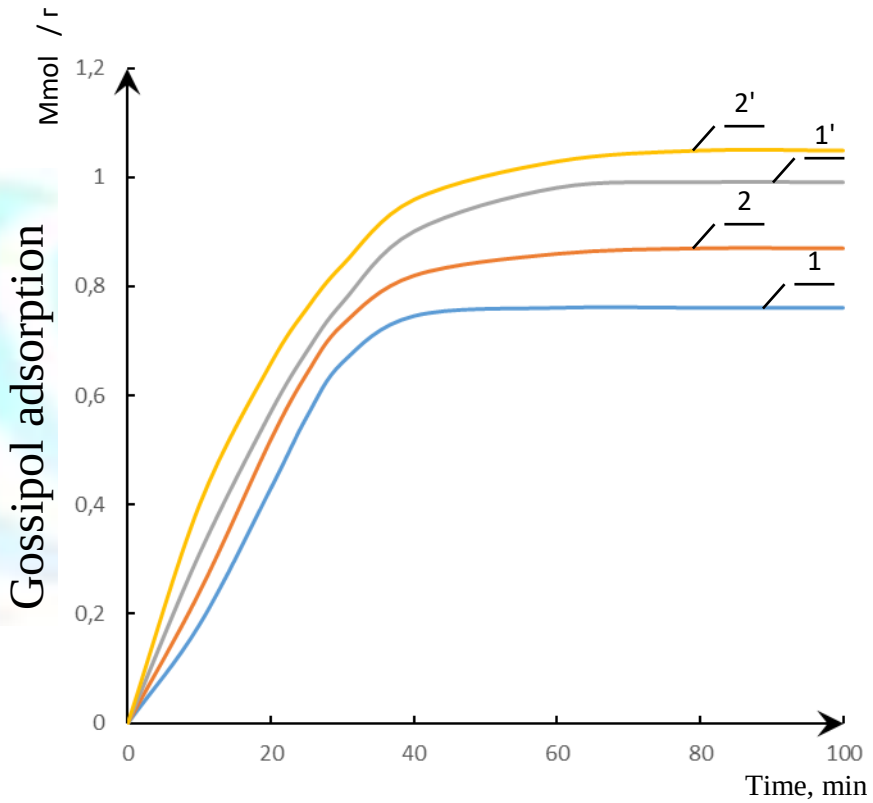

Figure 2. 1 - Askamar - 70 ° C; 2- Pakistan - 70 ° C;

1 '- Askamar - 90 ° C; 2'- Pakistan - 90 ° C

The main aspects in determining the mechanism of interaction of the adsorbent and the adsorbate have been identified, viz

- passage of adsorbent through the film in the outer layer of the adsorbent (internal diffusion);

- transition of the adsorbent to the inner layers, i.e. to the active centers (internal diffusion);

- interaction of the adsorbent with the adsorbent (physical or chemical sorption).

The effect of diffusion of adsorbent from oil volume to adsorbent It was found that rapid mixing is important in the system so that the adsorbent is at the same concentration on the oil-adsorbent boundary surface and throughout the volume.

In conclusion, the study of the adsorption process using local adsorbents obtained from chlorophyll, gossypol and its derivatives revealed that the process proceeds in a mixed diffusion mode, the pores and external diffusions affect the adsorption kinetics..

The study of adsorption kinetics in the example of gossypol and chlorophyll showed that a rise in temperature from 70 0 C to 80 0 C has a positive effect on the process, but an increase in temperature above 800 C leads to an acceleration of the oxidation process..

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