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CHANGE OF PHYSICO-CHEMICAL AND ADSORPTION PROPERTIES OF ALUMINUM OXIDE DRYERS MODIFIED WITH POTASSIUM NATURAL BENTONITE BASED ADSORBENTS

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Abstract

The influence of the composition of modified aluminum dryers obtained by centrifugal thermal activation technology on their physicochemical properties and dynamic capacity of water vapor when impregnated with alkaline (KOH, NaOH, LiOH) solutions is studied.

Key Words

Aluminum oxide, adsorption activity, Zeolites, Alkali metal, modified driers, Potassium content, dynamic strength.

INTRODUCTION: According to its properties, aluminum oxide is a catalyst, a desiccant, an inert carrier, a structural material in metal composites, and is used in the production of ceramic cutters, electrical ceramics, and chromatography [1-3]. The material's high adsorption activity and resistance to condensed moisture make it effective for drying compressed gases and air. However, the adsorption capacity of aluminum oxide for water is lower than that of Zeolites, which are usually used as a base layer in adsorbers for deep drying of gas streams [4]. Therefore, increasing its adsorption capacity is an urgent task. Using the method of centrifugal thermal activation of hydrargillite (CTA HG) with subsequent hydration of the product under mild conditions, it is possible to synthesize adsorbent-dryers with a high specific surface area and micropore size [5].

In this work, it was shown that the impregnation of aluminum oxide granules obtained by the CTA method (based on pseudoboehmite) with alkaline solutions of sodium or potassium leads to an increase in the dynamic strength of modified dryers containing 1.4 or 3 mass %. % of alkali metal with comparable values of static capacity. At the same time, a change in the structural properties was observed: a decrease in the specific surface area, an increase in the average pore diameter and the strength of the granules of the desiccants modified with metal

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hydroxide cations. According to the literature, the content of sodium or potassium ions in the studied samples is only 1.4-4.0%. changed in the weight range.

Synthesis and evaluation of the properties of adsorbents modified with potassium, sodium or lithium cations by absorbing powder or granules in order to expand the knowledge about the effect on the properties of adsorbents containing pseudoboehmite derived from alkali metal composition. Based on the CTA product, hydrargillite was produced as an adsorbent with suitable alkali solutions. To change the powders and granules of the adsorbent based on aluminum oxide, the method of absorption from the excess solution (balanced precipitation filtration) was chosen [6]. The amount of sodium and potassium ions in the samples ranged from 1.2 to 6.0. %, and lithium - from 1.3 to 4.1 by weight. %.

RESULT: The obtained experimental data showed that the specific surface area and total pore volume of the adsorbent resulting from the modification of aluminum oxide adsorbent powder or granules with sodium and potassium cations, along with the increase of the adsorbent composition increase is observed. change the cation in it. At the same time, the average diameter of the pores and the total pore volume, as well as the mechanical strength of the granules obtained from the original adsorbent powder are significantly lower than the samples obtained as a result of absorbing the granules.

The values of mechanical strength are higher and at the level of 4 ÷ 10 MPa when absorbing granules. The mean pore diameter for all modified samples was larger than that of the original sample. The total pore size for samples obtained by granule impregnation was higher than that of the original sample and decreased with increasing alkali metal content. Impregnation with lithium cations, even at low concentrations, causes a sharp decrease in the specific surface area. For the unmodified sample, the specific surface area is 290 m^2 /g, the specific surface area is 2 wt. % Li was 202 m^2/g, the specific surface area of 2 wt % Na was 222 m^2/g, and 2 wt % K was 260 m^2/g.

The mechanical strength of the granules modified with potassium with a potassium content of up to 4.5 wt. % and sodium with a sodium content of up to 4.0 wt. % was higher than that of the original sample. At a higher concentration of these cations, the mechanical strength of the samples decreases. The opposite is observed for samples modified with lithium. The strength of the samples modified with a low content of this metal is lower than that of the original. At the same time, at a higher content (4.1 g. %), the strength increases by 10.4 MPa. The dynamic strength of the obtained samples when the dew point is reached at -40.0 °C was in the range of 1.3-5.1g/ 100 cm^3, while a tendency to decrease with increasing alkali

metal content was observed. The dynamic capacity of the original sample was 4.6 g / 100 cm^3.

CONCLUSION: Thus, the conducted experiments showed that obtaining a modified adsorbent with a specific surface area of 250 m^2/g and high mechanical strength (not less than 5 MPa) only with the content of alkaline cations potassium 1 up to .6 wt % and sodium up to 1.2 wt %. A significant increase in dynamic strength could not be achieved using the selected annealing method, which may be due to a decrease in the specific surface area of the modified samples.

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