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BENZOL Adsorbation On Activated Coal Adsorbents

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ABSTRACT: The article extracted coal adsorbents from a mixture of petroleum and coke. The adsorption of benzole in coal adsorbents has been studied. It is found that an increased adsorption capacity of adsorbents K1, K2 and K3 under the thermal treatment of benzole adsorption. Micropores size in adsorbents (W0) was 94% at K1, 97% at K2, and 92% at K3 at adsorption (V_s). The saturation adsorption (a_s= mol / kg) were characterized by an adsorption capacity of K2 2.26 times, K 3, 3.05 times higher than the initial K1.

KEYWORDS: Coal, adsorption, isotherm, benzene, adsorbent.

I.INTRODUCTION

In connection with the rapid development of the chemical industry, the need for the introduction of resource-saving and waste-free technologies increases, as well as from the point of view of ecology, there are increased requirements for safe adsorbents. In addition, the production of effective, nanoporous and highly selective adsorbents from waste products of the oil and gas industry, as well as their use to solve environmental problems is of great importance for the country's economy. Among adsorbents, active coals differ significantly that of the from kaolin, activated bentonites [1] and modified montmorillonite [2, 3] by the active surface area and pore structure. In this regard, scientific research has been carried out on the treatment of industrial wastewater with adsorbents based on activated carbons obtained by various methods and various local raw materials [4].

The current study investigated the adsorption of benzol in thermally treated adsorbents from special hydron and cokefrom waste oil and gas industry. The adsorbents obtained were conditionally labeled K1, K2 and K3.

II.METHODS AND MATERIALS

The benzol vapor adsorption isotherms on the initial and activated coal adsorbents were measured on a Mac-Ben-sensitive quartz helix device [5]. Before measuring adsorption in adsorbents, the system was vacuumed to 1.33x10-3 Pa, heated to 25 ° C for 6-8 hours, and then adsorption isotherms were obtained.

The adsorbed benzolwas purified under vacuum conditions before use in adsorption, with the release of dissolved gases until its vapor pressure was the same as the vapor pressure data reported in the literature. [6].

III.RESULTS AND DISCUSSION.

Benzol adsorption isotherms on coal adsorbents were relatively low adsorption a = 0.122 mole/kg at K1 at relatively low P/P_s= 0.2 pressures, 0.153 mole/kg at K2, and 0.341 mole/kg at K3. At K1, the amount of adsorption at low pressures (P/P_s) is low, ie the adsorption at P/P_s = 0.8 is a = 0.15 mole/kg, which shows that the adsorption is mainly higher at the initial low pressures.

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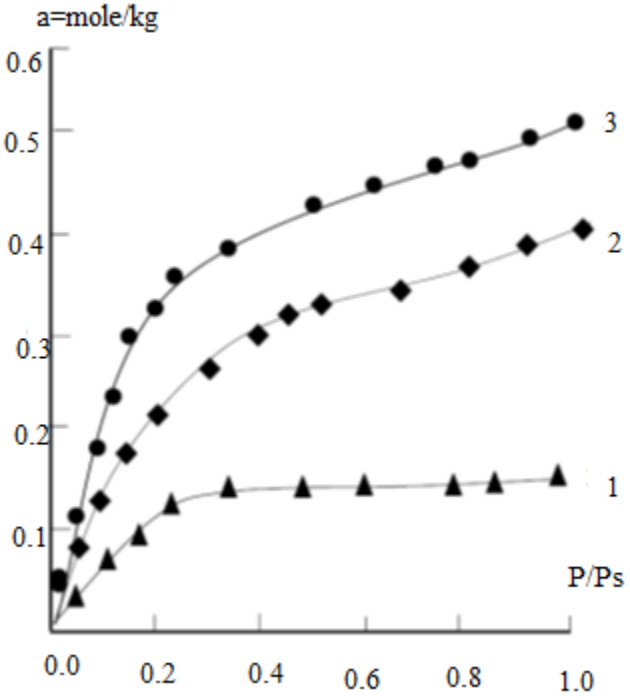

Figure 1. Benzol adsorption isotherms K1, K2, K3 on activated coal adsorbents

According to the adsorption isotherms in K2, the adsorption increased to a specific pressure P/P_s=0.6 a = 0.39mole/kg, and adsorption at K3 increased to P/P_s=0.4 and increased to a = 0.46 mole/kg. According to the classification of De Ber [7], adsorption can be divided into 4 types according to the form of hysteresis rings. Basing on the studied systems, adsorption isotherms are classified as the first type of adsorption isotherms.

Adsorption selectivity, adsorption and adsorption processes depend on the types of porosity, size, structure and properties of the adsorbents.The study of the porosity structure of the adsorbents is important for their targeted activity.

The adsorption volumes determined at different relative pressures (P/P_s) on the basis of adsorption isotherms are 0.2 (W), 0.4 (W_0),mesopores $W_{me}= V_s- W_0$, and saturation adsorption volumes (V_s) and the comparison surfaces (S) are given in the following table (Table 1).

Table 1

The pores size of adsorption of pyridine and acetonitrile vapor in the Navbakhor montmorillonite of pyridine type (m^3 / kg)

№	Adsorbents Types	$W\cdot10^{-3}$	$W_0\cdot10^{-3}$	$W_{me}\cdot10^{-3}$	$V_s\bullet10^{-3}$	$S\cdot10^{-3}$, m^2/kg	a_s, mole/kg
1.	K1	0,09	0, 016	0,001	0,017	20.5	0.19
2.	K2	0,131	0,037	0,001	0.038	32.8	0.43
3.	K3	0,321	0,048	0.021	0.043	62.7	0.58

The obtained adsorbents showed higher adsorption-structure performance than initial K1, namely solvent surface (**S)** and saturation adsorption ($\mathbf{a_s}$) At the same time, the activation surfaces of the adsorbents were found to be $12.3\cdot10^{-3}$ m^2/kg at K2 and $42.2\cdot10^{-3}$ m^2/kg at K2 compared to the initial adsorbent K1.Adsorbents were calculated by pore size, ie microwave size, equations of the theory of volume saturation of microwaves (TVSM)[8]. Microporessize (W0) saturation in the studied adsorbents was 94% at K1, 97% at K2, and 92% at K3. These adsorbents are characterized by the size and size of the porosity in microwave adsorbents.This means that the release of various gases and resins in the adsorption of the coal as a result of thermal activation leads to the formation of porosity in the adsorbent content, which increases the adsorption capacity.The effect of adsorbed molecules on micropores is larger than that of the other pores and is characterized by high adsorption at low relative pressures.

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Table 2

Dependence of activated coal adsorbents on the adsorption rates of benzol vapors at different relative pressures (P/Ps)

№	Adsorbents Types	Adsorption (mole/kg), at comparative relative pressures P/Ps			
		0.2	0.4	0.6	0.8
1.	K1	0,09	0,12	0,13	0,15
2.	K2	0,13	0,32	0,38	0,41
3.	K3	0,31	0,43	0,49	0,54

As can be seen from the table, the relative adsorption pressure of K2 and K3 coal adsorbents at P/Ps= 0.2 was 2.73 and 3.60 times higher than the initial adsorbent K1, respectively, and 1.33 and 3. 44 P/Ps= 0.8.The monolayer capacity of the studied coal adsorbents ($a_м$ mole/kg) was 44.74% at K1, 31.60% at K2, and 44.82% at K3. The adsorbents on saturation adsorption (a_s=mole/kg) were characterized by a 2.26-fold increase at K2 and 3.05-fold higher at K 3 than in the initial K1.

IV. CONCLUSION

It can be said that the adsorption capacity of coal adsorbents K1, K2 and K3 according to benzol adsorption conditions is increased. The results of this study allow the use of activated coal adsorbents as effective and inexpensive adsorbents for the adsorption of oil products and polar molecules in wastewater. At the same time, with the use of other innovative methods of activation of coal adsorbents, the porosity of the adsorbents, the surface surface, the lyophilic adsorption and the structural properties can be further enhanced.

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