PROTECTING THE ENVIRONMENT FROM THE PHENOL

Annagiev M.Kh.*, Bayramov S.S., Alidzhanova S.M.
Institute of Chemical Problems named after academician M.F. Nagiyev
of National Academy of Sciences of Azerbaijan
340143, 42 143. Baku-143, H. Javid avenue, 29
Fax: (99412) 5108593 E-mail annagiyev@gmail.com

At the present time, the growth of toxic polyutanta - phenol in the environment due to air dumping of petrochemical refineries companies producing of different substances and other organizations. It is known that phenol - a dangerous poison because it adversely affects on the health, causes the various diseases of living organisms. The problem of purification of air and industrial waste water from phenol is one of the most important and also difficult to solution. Despite the many developments in cleaning the environment from phenol pollution this problem can not be solved [1-3]. It should be noted that at the oil refining the toxic substances including the volatile phenols with high concentration are formed. There are various methods of cleaning the air from volatile phenols and waste water from dissolved phenol. By using the various organic and inorganic sorbents it was possible to remove these admixtures from the flow of air and waste waters. Effective sorbents based on available, cheap, heat and acid proof diatomite and bentonites from Absheron field by processing them with nitrogen containing organic substances are formed. When studying the adsorption of phenol on the natural bentonite and diatomite samples it was found that the number of adsorbed molecules on their surface is not great. The processing the samples by organic reagents greatly increases their adsorption properties with respect to phenol molecules. It was found that bentonite adsorbs phenol from the air and waste water significantly better than diatomite.

We have studied the adsorption of phenol on the natural and modified forms of diatomites and sorbents on the base of bentonite. The amount of physical and chemical adsorption of phenol by methods of derivatography and spectrophotometry were determined. By the method of derivatography it was found that on sorbents surface there are a number of adsorption centers with respect to the molecules of phenol which differ in energy.

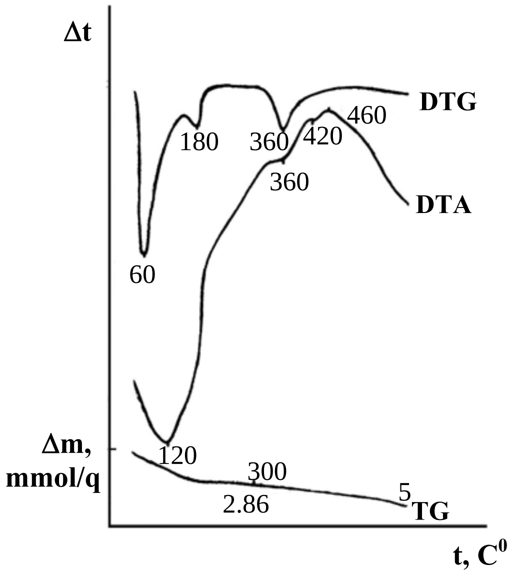

Fig.1. Derivatogram of natural diatomite after the adsorption of phenol.

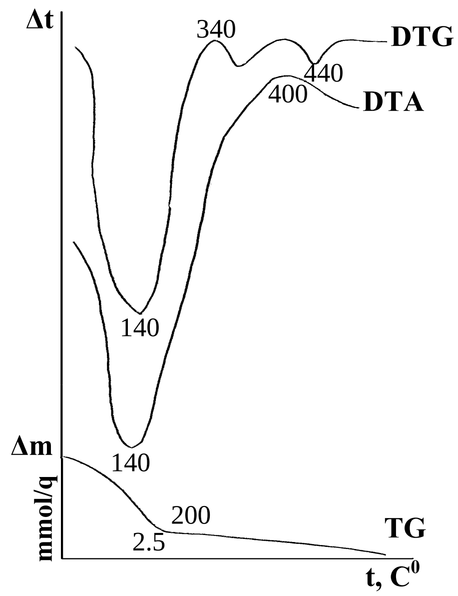

Fig. 2. Derivatogram of natural bentonite after adsorption of phenol.

Studying the basic centers on the diatomite surface at dioxide adsorption by derivatography method the concentration and strength of active and adsorptive centers on the outer and inner surface of samples are researched.

The derivatograms of natural diatomite after adsorption of phenol molecules on its surface were recorded. On the DTA curve there are three endothermic effect with maximum of temperatures at 120, 360, and 420^0C, and one exothermic effect at 460^0 C (Figure 1).

First endothermic effect, with maximum of temperatures at 120^0C corresponds to desorption of physically adsorbed molecules of phenol from the surface. It should be noted that the critical diameter of phenol (dkr = 6.6 Å) does not allow it penetrating into the bulk of diatomite. Adsorption occurs only on its outer surface. The appearance of endothermic effect on DTA with temperature maximum at 120, 360, 420^0C is indicative of the existence of the surface low, medium and strong basic centers differing from each other on energy. Exothermic effect at 460^0C characterizes the oxidation of phenol molecules on the outer surface of the sorbent. The minimum on the DTA curve at 180^0C shows that there is a change in the speed of desorption of phenol from the sorbent surface.

Derivatogram of natural bentonite from Absheron field after the adsorption of phenol molecules are presented in figure 2. One endothermic effect at 140^0C and one exothermic effect with maximum temperature at the 400^0C appear on the DTA curve of heated bentonite with adsorbed phenol molecules. But on the DTG curve of this bentonite there are minimum at temperatures of 140, 340, 440^0C, that show on the change of speed of mass loss. As can be seen from the TG curve of mass loss equals to 10-12%.

Conclusions

We have showed that the concentration of the basic centers on the outer surface is smaller than on the inner one. In determining the strength of basic centers on the outer surface of the diatomite samples it has been established that there are several types of strong centers, which are actively involved in the process of purification of air and liquids from phenol. The method of regeneration of used adsorbents from phenol has been developed. These sorbents are encouraged to use at the cleaning of the flow of air and waste water from phenol.

References

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