A rapid method of studying the characteristics of carbon fibre sorbents by dynamic sorption was developed. It was shown that in the 40-200°C temperature range, equilibrium between the sorbed and vapor phases of benzene is attained in the selected desorption conditions. The results obtained are in agreement with the static sorption data and can be used to comparatively evaluate the porosity of CFS.

Carbon fibre sorbents (CFS) are characterized by high sorption activity, since in contrast to granulated sorbents, their surface layer primarily contains micropores which play a basic role in molecular adsorption. The pore structure of CFS is formed during activation — selective etching of the surface layer of the carbon fibre. The development of porosity during this process is a function of the type of starting fibre and conditions of activation. Predominant opening of pores 0.5-0.6 nm in size takes place for low degrees of combustion loss [1]. Either an increase in the number and size of the micropores or destruction of the pore structure and smoothing of the surface, which naturally decreases the quality of the sorbent, can be observed with an increase in the degree of combustion loss.

The best known method for studying the structure of CFS without destroying it is the method of sorption from the gas phase conducted in static conditions. Despite its popularity, this method has a number of drawbacks. First, it requires prolonged (several days) preparation of each sample directly in the sorption installation. The gravimetric method used in this case is insufficiently sensitive for a low partial sorbate pressure, which eliminates the possibility of obtaining a complete pore size distribution curve for microporous sorbents. Finally, the sorption process in real conditions of use of the sorbent differ significantly in dynamics from the process conducted in static conditions.

To eliminate these drawbacks, we used the method of investigating sorption in dynamic conditions [2]. The studies were conducted on the sorption installation shown in Fig. 1. The installation consists of a unit for preparation of the vapor—gas mixture, an adsorber, and a chromatograph. The vapor—gas mixture was prepared by passing argon at a given temperature over the surface of a liquid adsorbate in saturator 1 and subsequent dilution of the mixture with argon in mixer 2 to the required concentration of the adsorbate. Since sorption almost totally ends on microporous sorbents at a relative partial sorbate pressure of \( P/P_s = 0.15 \) [3], vapor—gas mixtures of the corresponding concentration were used. A sample of CFS weighing 0.25 g was placed in adsorber 5, a metal tube with an internal diameter of 4 mm, placed in air thermostat 11. The sorbent layer height was 70 mm. The adsorber with the sample was first evacuated in a vacuum setup at 150°C, filled with argon, and transferred to the sorption installation.

The sorption dynamics were investigated by measuring the concentration of sorbate in the vapor—gas mixture before and after the adsorber; the mixture was delivered to chromatograph 9, 10 through metering cock 7 by doses every 0.5-2 min using the system of cocks 4 and by-pass line 6. Chromatographic column 9, 1.2 m long, was packed with Chezosorb AW sorbent (0.200-0.360 mm fraction) with Carbowax 1500 liquid phase. The chromatograph constant was established based on the increase in the weight of the adsorber during sorption. Chromatograph flame-ionization detector 10 had a sensitivity for benzene of \( 3\times10^{-8} \) mole/liter.

Adsorption was conducted in the isothermal regime at 40°C by continuously passing the vapor—gas mixture through the sorbent layer with a constant rate of 1 ml/sec, monitored with flow-meter 8. The process ended when the sorbent was totally...
saturated, i.e., when equilibrium was established between the sorbed sorbate and its vapor in the starting mixture. Desorption was conducted in different temperature conditions on the same installation by continuously passing argon through the adsorber at the rate of 1 ml/sec.

The output curves for the adsorption and desorption regimes were obtained as a result of the experiment (Fig. 2). The adsorption capacity ($a_c$, mole/g) of CFS was calculated with the adsorption output curve using the equation [4]

$$a_c = C_0 Q/m [\tau_{br} + (\tau_x - \tau_{br})\varphi]$$.