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SYNTHESIS AND RESEARCH OF POLYAMPHOLYTE BASED ON GLUTAMINE ACID

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Abstract*. The synthesis and thermal stability of immobilized polyampholyte obtained on the basis of covalent attachment of glutamic acid to the epoxide matrix was studied in the article. As a result of thermal studies, it was found that the formed polyampholyte is stable up to 195°C.The Brunauer, Emmett, and Teller (BET) method was used to study the structural and sorption properties of the sorbent based on their absorption of water vapor at low pressures and it was found that the resulting sorbent is mesoporous and has high sorption properties. When studying the static exchange capacity of sorbents synthesized on the basis of amino acids, it was found that the sorbent obtained on the basis of amino acetic acid has the highest ability.*
Keywords*: glutamic acid, microstructure, mesoporous and has high sorption properties, polyampholyte, thermal stability.*

Introduction. Chelating polymers are widely used in analytical chemistry for separation and concentration of natural and waste water. One of the main tasks of the chemical industry is the synthesis of polymer ligands, that is, chelating sorbents, separation of intermediate metals from solutions using complex-forming sorption methods, composition, structure, and physicochemical properties of coordination compounds formed during sorption. The use of sorbents in the process of extracting metals from solutions by complexation allows selective extraction of metals in the form of complex compounds. Therefore, it is necessary to regularly study the possibilities of forming coordination compounds of metals with sorbents and to determine the stability of the obtained substances in solutions [1]. This paper provides a brief overview of the use, theory and future prospects of traditional and new materials for the adsorption of heavy metals in wastewater treatment [3; pp. 91-106]. In the following work, a chelating ionite was synthesized on the basis of guanidine, epoxy resin and polyethylene polyamine, the effect of temperature on the properties of the chelated ionite was studied, and according to the results of the analysis, it was observed that the ionite is stable up to a temperature of 271,980C. Ionite is recommended for use in the sorption of copper ions from high temperature solutions [2]. The sorption of copper and silver ions was studied in ionite synthesized on the basis of epoxy resin, glycine and polyethylene polyamine. EGP-1 ionite has a high static exchange capacity for copper and silver cations when the mole ratio of the initial substances is 1:1:0.4 [3]. By researchers [4] sorption properties of polyampholyte obtained as a result of covalent bonding of ortho-aminobenzoic acid (OABK) to epoxy resin were studied with d-metals, especially copper, nickel, zinc, cobalt and silver ions. Static exchange ability, microscopic structure and temperature stability of polyampholytes have been determined. The structure of the forming chelate sorbent was determined by the IK-spectroscopic method and the exchange capacity of Cu (II) and Zn (II) ions was established [5].

Ions of heavy metals such as nickel, cobalt, zinc, chromium, copper, lead, and cadmium cause serious environmental problems for animals, plants, and humans due to their extreme

toxicity [6].Therefore, the use of chelating polyampholytes, which show high selectivity for non-ferrous metal ions, is one of the promising directions in the practice of wastewater treatment.

2. Experimental Part. In order to control the properties of synthesized polyampholyte and improve its performance, a polycondensation type sorbent was obtained as a result of polymer analogue changes. The process of covalent immobilization of glutamic acid with epoxy resin was carried out at a temperature of 50 °C at a molar ratio of 2:1 starting materials, a little polyethylene polyamine was added as a hardener, and the duration of the reaction was 20 minutes. The resulting mass was poured into a porcelain container and dried in an oven at a temperature of 70-80 °C for 24 hours. The product of the EGP-2 (epoxy resin: glutamic acid: polyethylene polyamine) reaction with 89% yield is a yellow resinous mass.

3. Results and Discussion. The derivatogram of the polymer ligand given in Figure 1 shows endothermic effects at three temperatures of 195, 401 and 445°C. Endothermic effect at a temperature of 195°C and 1st mass reduction (3.5%) in the temperature range of 26-283°C is due to the release of sorbed water contained in the polymer ligand.The endothermic effect at a temperature of 401°C is caused by the release of formaldehyde from the decomposition of diphenylolpropane in the straight chain of the sorbent. A sharp decrease in mass at 283.5-453°C (71.04%) is caused by the complete destruction of the sorbent macrochain, the release of gases such as N_2, CH_4, C_2H_6, C_2H_4, C_3H_8, C_3H_6 and the formation of liquids due to a sharp increase in temperature. , also occurs due to the formation of CO_2, CO, NH_3, C as a result of decarboxylation from amino acid and breaking of other bonds.

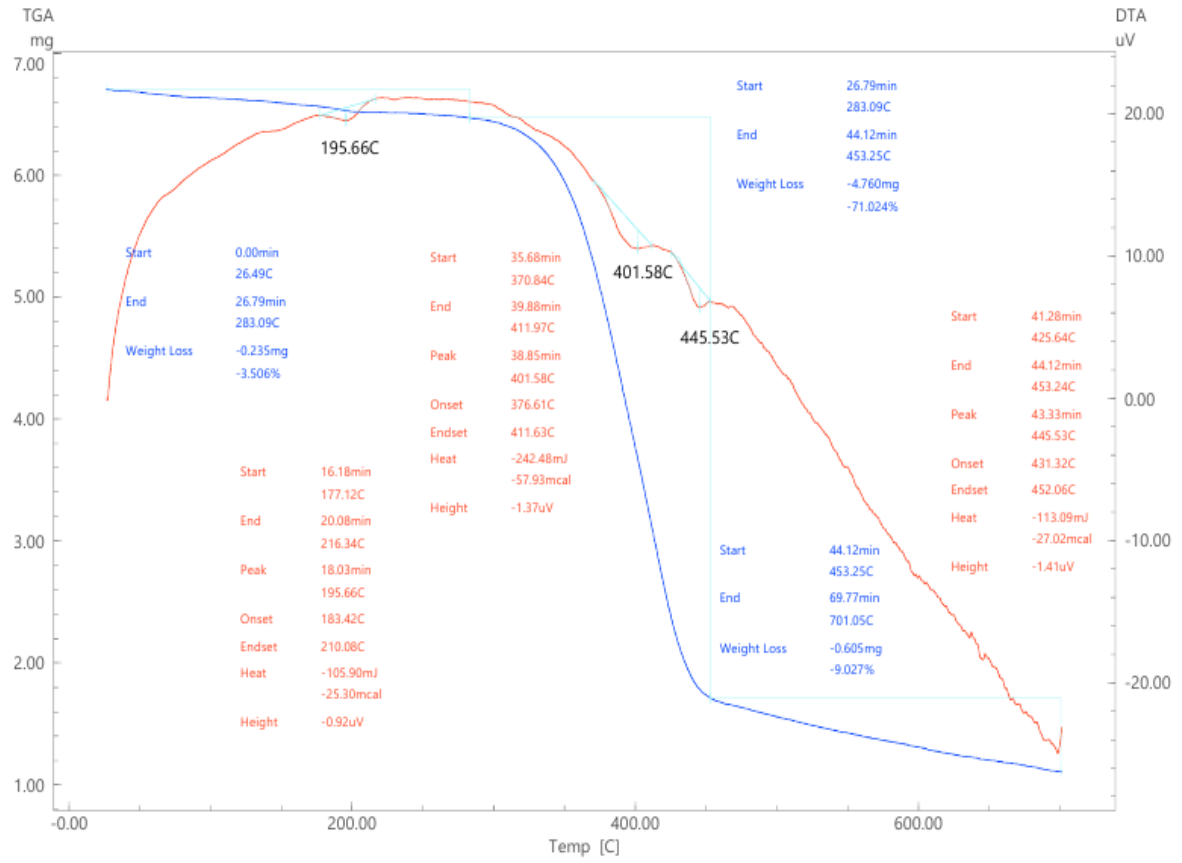

Figure 1. Derivatogram of polymorpholyte EGP-2.

Structural sorption properties of polyampholyte were determined. The relative pressure dependence isotherm of water absorption on the surface of polyampholyte was constructed (Fig.

2). According to the obtained results, the calculated surface properties of the sample are presented in Table 1.

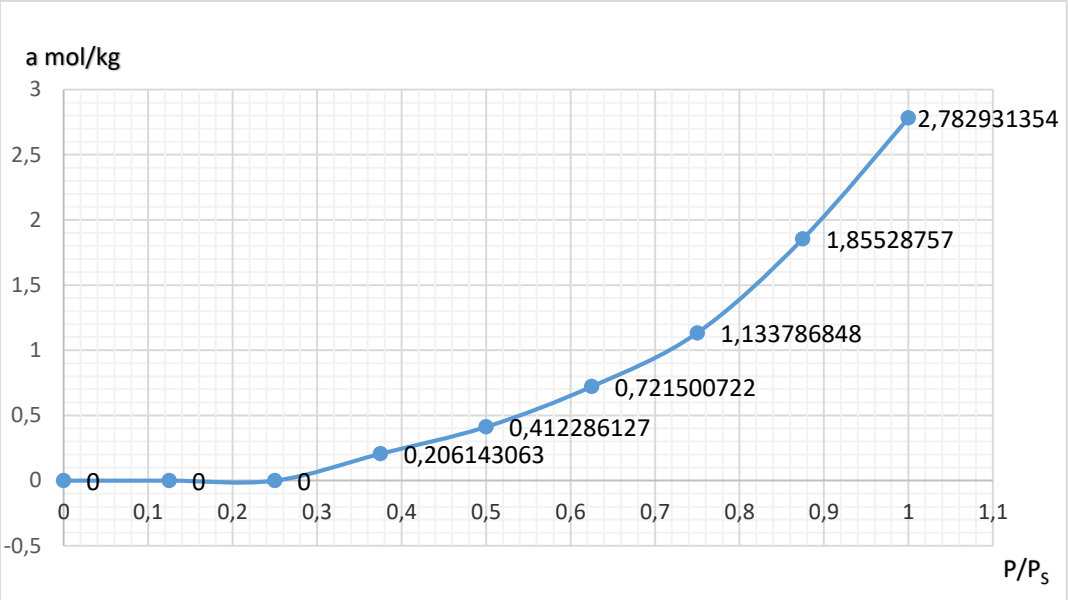

Figure 2. Water vapor isotherm at 20°C according to EGP-2.

Table 1.

Structural and surface characteristics of EGP-2

№	Sorbent	Capacity of monolayers, mol/kg	Comparison surface, m2/g	Saturation volume, l	Pore radius, Å
1	EGP-2	0.122	7.90	0.05	126.8

It can be seen from the table that the average radius of the pores of the sorbent based on epoxysmol: glutamic acid: polyethylene polyamine is high, which indicates that it is hyperporous.

Accordingly, the sorption capacity of the obtained polyampholyte for some d-metal ions was studied. The data presented in Table 2 showed that the polyampholyte synthesized in the 1:2:0.02 mol ratio of epoxy resin: glutamic acid: polyethylene polyamine has a high static exchange capacity for metal ions.

Table 2.

Static exchange capacity of EGP-2 with respect to ions of some d-metals

Epoxymol: glutamic acid: polyethylene polyamine	Reaction Product, %	Static exchange capacity, in 0.1 N solution, mg-ekv/g				
		$CuSO_4$	NiCl2	CoCl2	CdCl2	ZnSO4
0.5:0.5:0.01	79	4.8	4.2	3.8	3.5	3.2
1.5:1.5:0.02	85	5.5	5.1	4.1	4.2	4.8
1:2:0.02	89	6.8	6.2	5.5	5.3	5.6

4. CONCLUSIONS. Thus, polyampholyte EGP-2 was obtained by immobilization of glutamine acid in an epoxy resin matrix; it is stable up to 195°C; it is recommended for use in the sorption of some d-metal ions from solutions of higher temperatures.

It also has a high sorption capacity for non-ferrous metals due to its mesoporous surface structure.

During the synthesis of sorbents, the effect of the molar ratios of the starting materials on the composition and physicochemical properties of the synthesized sorbent was studied, and the optimal synthesis conditions were determined.

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