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SEM ANALYSIS OF IONS BASED ON UREA, THIOcarbamide, AND SOME ALIPHATIC AMINO ACIDS

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Abstract: Complexes were obtained by adding Zn(II) and Cd(II) salts with ligands obtained based on modification of urea-tiurea resin with aminoacetic acid, aminosuccinic acid, 2-aminopentane diacids. The composition of the obtained complexes was studied by element analysis in a scanning microscope.

Key words: urea-tiurea resin, Zn(II) and Cd(II) salts, (TG-DTA).

Introduction. Currently, ionites (ion-exchanged ionites) are widely used in hydrometallurgy for the sorption concentration of various ions, as well as for the elimination of waste containing harmful components, which may be heavy metals [1]. The covalency of the bonds formed by metal ions with ionite functional groups increases as the level of hydrolysis decreases [2]. Complex-forming melamineformaldehydethiourea (MFT) ionite was synthesized and its sorption properties and selectivity for Au3+ ions were studied by periodic and column methods. It was observed that MFT ionite has a higher tendency towards Au3+ ion than Cu2+ and Zn2+ ions [3]. The sorption separation of gold (I) and silver (I) ions from solutions was studied based on the binding of polyglycidol to polystyrene particles, and the possibility of 99% separation of gold and silver ions was shown [4]. Activated carbon [5], natural and synthetic zeolites, modified chitosans [6], biosorbents and other reagents are also used for the sorption of intermediate metals. Separation of small amounts of intermediate metals in the solution from solutions with a complex composition is carried out by changing the solution environment [7].

Experimental part. Zn(II) and Cd(II) salt solution sorption was carried out on the basis of Amino acids formalin thiourea melamine $(NH_2)_2CS$. 0.01 mol of thiourea and 0.01 mol of formaldehyde were added to the porcelain mortar and melted at 80-100^{0}C, NH4OH solution was added dropwise until the mixture medium became pH=8. After the mixture reached a viscous mass, aqueous solutions of 0.01 mol of glycine and amino acid were mixed and added, the temperature was raised to 110^{0}C and heated for 2 hours until a plastic mass was formed. The resulting resin was dried in a drying oven at 50^{0}C for 30 minutes. The dried solid was washed 4-5 times with 0.1 N HCl, 5% alkali solution, and distilled water. A 0.1n 10 ml solution of the purified substance was prepared and 30 ml of zinc salt was added to it and sorbed for 1 day. The concentration and physicochemical properties of the resulting sorbed complex were studied.

SEM and elemental analysis of the synthesized ionites

Morphological properties of new MFA and MFG complex-forming ionites were measured with a scanning electron microscope and analyzed.

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Scanning electron microscopy (SEM) allowed us to see that the ionite morphology was similar to other ionites described in the literature. SEM photographs of ionite with magnifications of 100 µm and 250 µm, respectively, were presented. It can be seen from the images of this photo that the structure is mostly composed of unevenly arranged grains and sharp edges, and the structure is more porous. This indicates that the ion exchanger has a very high sorption capacity or ability to absorb ions of various metals. Figure 1 below shows the surface structure of MFA ionite along with the elemental composition of MFA ionite (Figure 2).

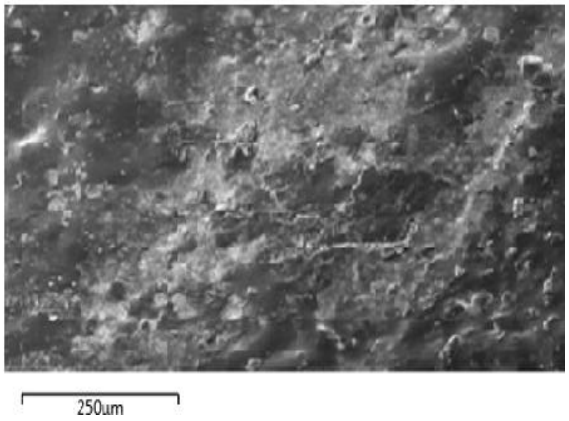

Fig.1. SEM image of MFA ion exchanger surface. (250 µm).

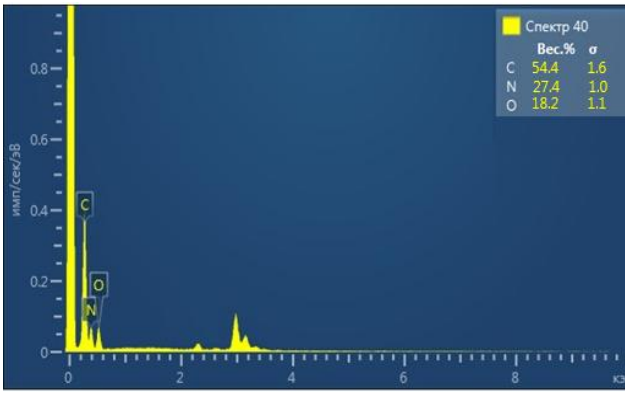

Fig.2. Elemental composition of MFA ionite, %

As can be seen in the photo taken at a size of 250 µm, we can observe a high rate of adsorption process in the micropores of the formed ion exchange complex. The element composition was analyzed based on the table in Table 1 using the given figure.

Table 1

Quantitative elemental analysis parameters of MFA ionite

Element	Amount, %	Sigma mass, %	Standard
C	54,4	1,6	C Vit
N	27,4	1,0	BN
O	18,2	1,1	SiO_2
total:	100,00		

Table 2 shows the percentages and gross formulas of complex compounds formed by MFA ionite with some d-metals.

SEM images obtained after sorption of newly synthesized MFG ionite with Cu ions were analyzed. The surface of the MFG is also porous and consists of uneven curvatures, as can be seen in the picture below (Figure 2).

Table 2

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Elemental analysis of MFA ionite with basic d-metals

The color of the complexed ionite	Metal ions	Calculated, %					Gross formula of ionitnig formed by the complex
		C	H	N	O	Me	
MFA							
Apostle	Ni^{2+}	40,91	5,97	20,74	23,69	8,69	$(C_9H_{14}N_5O_5)_2$ Ni
		35,82	4,64	23,2	26,5	9,78	
Pink	Co^{2+}	40,89	5,97	20,73	23,68	8,72	$(C_9H_{14}N_5O_5)_2$ Co
		35,8	4,64	23,2	26,5	9,78	
Colorless	Cd^{2+}	37,89	5.53	19,21	21,95	15,42	$(C_9H_{14}N_5O_5)_2$ Cd
		32,92	4,27	21,3	24,4	17,07	
Shiny white	Zn^{2+}	40,50	5,91	20,54	23,46	9,59	$(C_9H_{14}N_5O_5)_2$ Zn
		35,46	4,59	22,9	26,3	10,67	
Don't worry	Cu^{2+}	40,61	5,93	20,59	23,52	9,34	$(C_9H_{14}N_5O_5)_2$ Cu
		35,5	4,6	23,02	26,3	10,5	

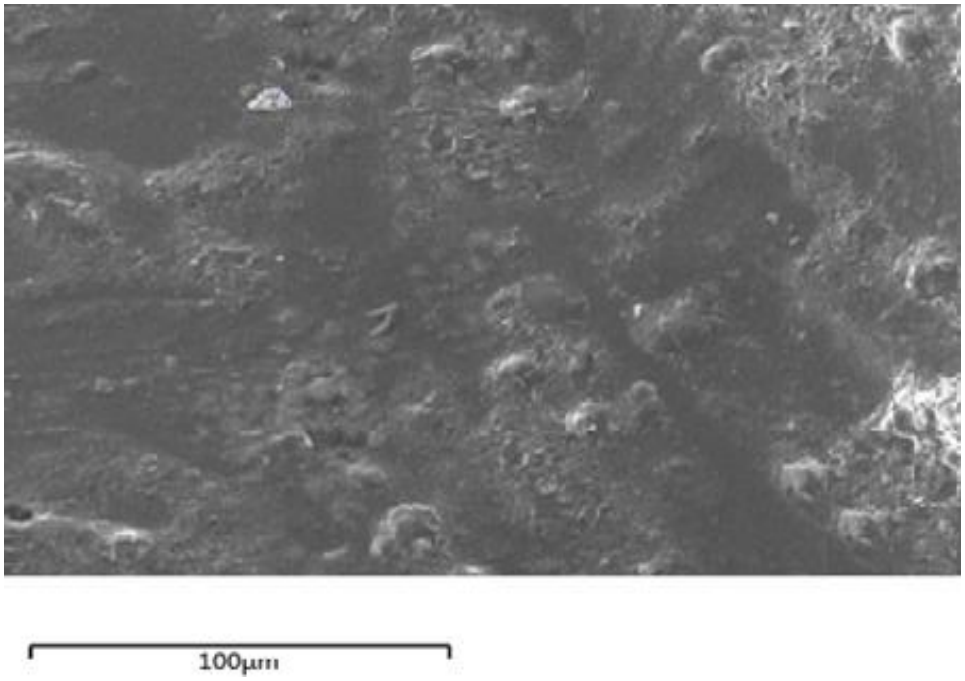

Fig.3. Scanning electron microscopic image (100 µm) of the ion exchange MFG+Cd surface.

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We can clearly see the metal ions in the 100 μm magnification of the scanning electron microscope scanned photo of the MFG+Cd surface. It can be concluded that MFG ionite sorbs metal ions very well.

Conclusion: The morphological characteristics of new complex-forming ionites and sorption with some d-metals were analyzed using a scanning electron microscope (SEM). When studying the morphology of the ionites, it was possible to see their similarity to other ionites described in the literature.

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