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Issue Article

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SYNTHESIS OF COMPLEX COMPLEX STORAGE WITH NITROGEN, PHOSPHORUS, SULFUR

Abstract: *In this paper, the synthesis of a complex compound in the presence of paraisocyanate, urea, and orthophosphate acid was studied. Optimal conditions for the synthesis of the complex were determined and studies were conducted on the effect of molecular ratios of starting materials on the composition and physicochemical properties of the synthesized complex. The specific volume of the synthesized complex and the values of static exchange capacity were studied, and the mechanism of the formation reaction according to the results of IR spectroscopy, TGA, DTA and chemical analysis was proposed.*

Key words: *storage, nitrogen, phosphorus, sulfur.*

Language: *English*

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Introduction

One of the most serious problems limiting their efficiency in metal processing today is the complex chemical composition of these industrial solutions and wastewater. A promising solution to these problems is the synthesis of new, more advanced complexes that selectively affect known metal ions [1]. It is known that industrial methods of preparation of materials of such complex compounds are polycondensation, polymerization and copolymerization of functional monomers [2]. Because the functional groups of the monomers change during the polycondensation process, the composition of the initial monomers and the resulting polymer units are often not the same [3]. Various amines have been synthesized on the basis of formalin and thiourea, and the sorption properties of certain samples of sorbents with ion exchange, and complexing properties have been studied [4]. It has also been synthesized and studied the physicochemical properties of sorbents based on the interaction of thiourea, epoxy resin with various amines [5-6]. To improve the kinetic and sorption properties of sorbents, it is expedient to synthesize them from multifunctional compounds containing electronic-donor functional groups [7].

Purpose, and research methods.

The aim of the study is to synthesize a new immobilized ligand based on O, O-di- (2-aminoethyl) -dithiophosphate potassium O, O-di- (2-aminoethyl) -

dithiophosphate on a urea-formaldehyde matrix with high complexing properties to copper and silver cations.

IR spectroscopic studies have been carried out on an infrared IR Fourier spectrometer IRTracer-100 SHIMADZU (Japan) (range 400-4000 cm-1, resolution 4 cm-1), by powder method. The interpretation of the spectra was carried out using basic software that implements automatic measurement of spectra, as a means of the graphical display of spectra and their fragments and forms the work with the library of user spectra.

Thermoanalytical studies have been carried out on a Netzsch Simultaneous Analyzer STA 409 PG device (Germany), with a K-type thermocouple (Low RG Silver) and aluminium crucibles. All measurements have been carried out in an inert nitrogen atmosphere with a nitrogen flow rate of 50 ml/min. The temperature range of measurements was 25-370 ° C, the heating rate was 5 K / min. The amount of sample per measurement is 5-10 mg. The measuring system has been calibrated with a standard set of substances KNO3, In, Bi, Sn, Zn.

IR spectroscopic and thermoanalytical studies have been carried out in analyzers at the Tashkent Scientific Research Institute of Chemical Technology.

Procedure. In a three-mouthed round-bottomed flask equipped with a mechanical stirrer and thermometer, 5 g of paracyanate, 6 g of urea, and 10 ml of orthophosphate acid Procedure. In a three-mouthed round-bottomed flask equipped with a mechanical stirrer and thermometer, 5 g of paracyanate, 6 g of urea, and 10 ml of orthophosphate acid were poured and heated at 60–70 ° C for 6–7 h until a light yellow colour appeared. The resulting complex was neutralized with a 3-5% HCl solution for 2 h, then washed with distilled water and dried in a drying oven at 50–60 ° C for 6 h, the resulting compound was cooled and ground in a porcelain mortar. Productivity was 89%

Polycondensation reactions of urea with paracyanate have been performed at 40, 50, 70, and 90 °C. During the experiment, the reaction time, the specific volume of the gel sorbent, and the static exchange capacity (SAS) were determined. poured and heated at 60–70 ° C for 6–7 h until a light yellow colour appeared. The resulting complex was neutralized with a 3-5% HCl solution for 2 h, then washed with distilled water and dried in a drying oven at 50–60 ° C for 6 h, the resulting compound was cooled and ground in a porcelain mortar. Productivity was 89%

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Table-1.

№	Temperature °C	Time reactioni, hour	SAS 0,1 n HCl in solution , mg-ekv/gr	SAS 0,1 n NaOH in solution, mg-ekv/gr	To'liq almashinish sig'imi, mg-ekv/gr
1	40-50	11-12	2,5-2,8	1,8-2,0	4,3-4,8
2	50-60	8-9	2,7-3,0	2-2,2	4,7-5,2
3	60-70	7-8	3,0-3,5	2,2-2,5	5,2-6,0
4	80-90	5-6	2,3-2,7	1,6-1,8	3,9-4,5

The values in Table 1 above show that the duration of the polycondensation reaction in the temperature range of 40–50 ° C is 9–10 h, and the static exchange capacity of the sorbent is 4.8 mg-eq / g. This polycondensation method reduces the plasticity of the sorbent and its static exchange capacity. When the temperature is kept in the range of 60-70 ° C, the reaction time is 6-7 hours. At this temperature, the course of the polycondensation reaction is somewhat balanced, and the total exchange capacity of the resulting sorbent reaches 6 mg-eq / g. When the temperature is raised to 80-90 ° C, the polycondensation process accelerates and the structure of the sorbent obtained at high temperatures becomes much denser, which leads to a slight slowing down of the mobility of the ionic groups in the sorbent. Therefore, a range of 60–70 ° C was selected for the optimum temperature of the polycondensation reaction.

IR spectrum of a coordination compound synthesized in the presence of urea and isocyanate.

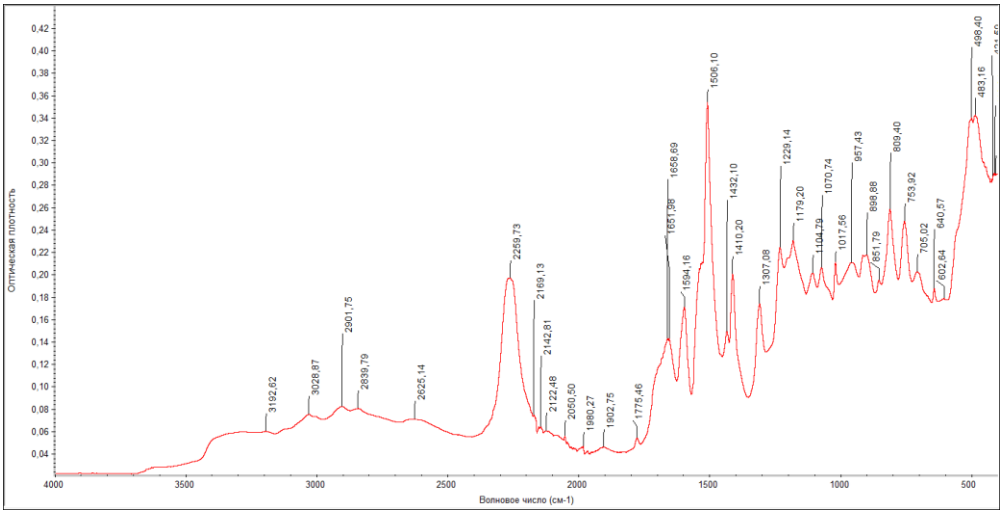

Figure 1. IR spectral analysis of a coordination compound synthesized in the presence of urea and isocyanate

Table 2. Absorption frequencies in the IR spectrum of the coordination compound, cm^{-1}

Vibration classification	ν(OH)	ν(=C-H)	δ(CH_3)	ν(CH_2)	ν(PO)OH	δ(-C≡N)	ν(-C≡C-)	ν(-C=C-)	ν(-C=O)	δ(-C=N-)	NH_2	NO_2	-P-O-C-	ν(P=S)
Wavelengths are cm^{-1}	3192	3028	2901	2839	2625	2259	2169	1980	1775	1594	1410	1307	1070	753

From the data in Table 2 above, it can be seen that the oscillation frequency *ν* (P = S) in the complex is relatively high and the oscillation frequency *δ* (-C = N-) is shifted to a relatively low range. It can be seen that the groups in the complex provided the coordination of the metal ion and formed the basis for the formation of the ring.

Figure 2. Sorbent sorption synthesized on the basis of urea and isocyanate.

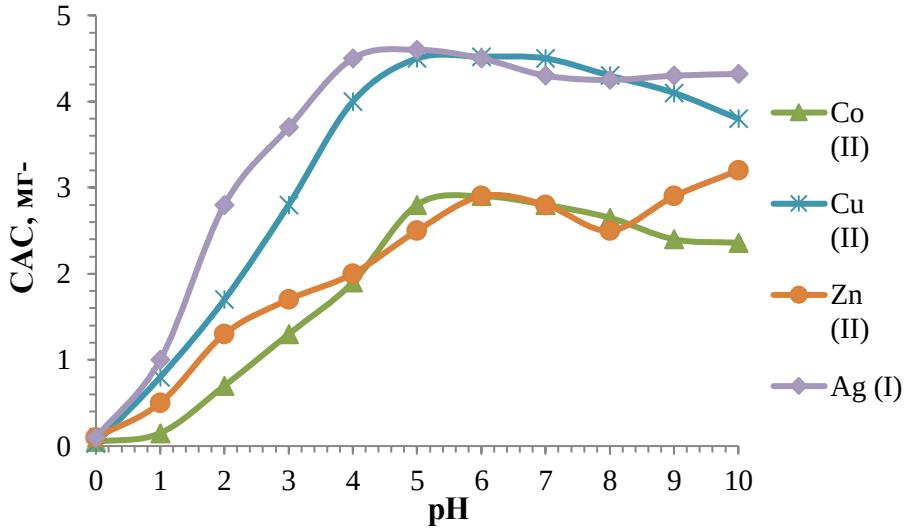

Figure 2. The pH dependence of the sorption of a sorbent synthesized on the basis of urea and isocyanate with respect to Co (II), Zn (II), Ag (I) and Cu (II) ions was studied.

Figure 3. The results of thermal analysis of a sorbent synthesized on the basis of urea and isocyanate in the temperature range of 20-600 ° C are shown.

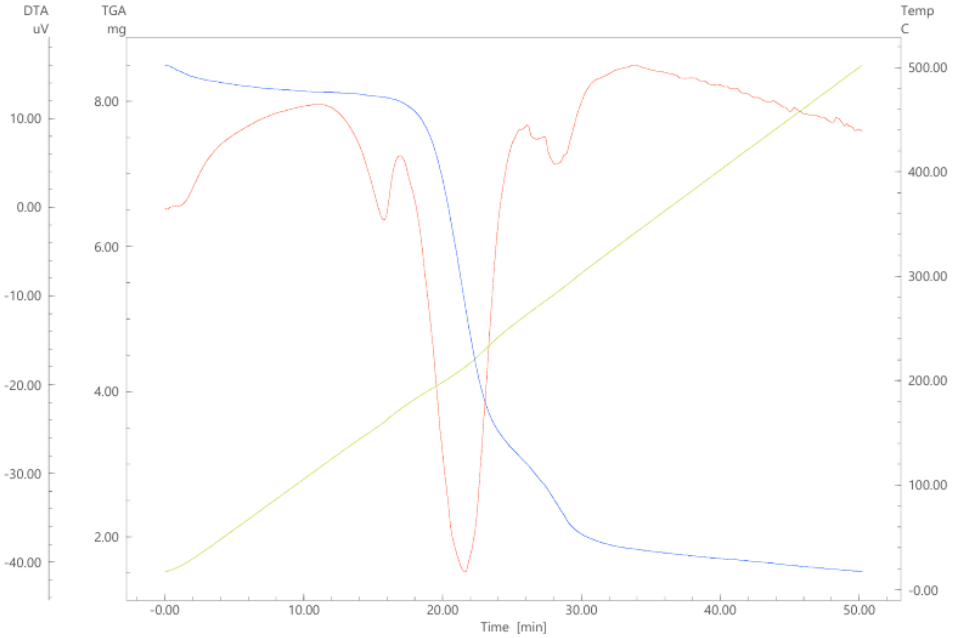

Figure 3. A thermal analysis of a synthesized on the basis of covalent immobilized ligand and EPS-D2AETFR.

As a result of the analysis of TGA and DTA obtained, the complex decomposition of the sorbent synthesized in 2 stages revealed. The first thermal decomposition began at 23.74 ° C and lasted 24.72 minutes to 263.87 ° C and ended with a loss of -10.715% mass due to evaporation of the water in the compound. The second thermal decomposition began at 263.87 ° C and continued to 600.94 ° C, lasting 59.03 minutes with a mass loss of 15.344% due to the decomposition of the substances in the mixture. The DTA analysis also observed two exothermic transitions at 293.68 and 348.06 ° C.

Conclusion.

As a result of the research, a sorbent was synthesized, and the sorption of silver (I) ions into the synthesized sorbent was studied. The composition and structure of the coordination compound formed during the sorption process were determined using IR spectroscopy, TGA, DTA analysis. Based on the results of the analysis, it was proved that silver (I) is coordinated by sulfur atoms.

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