OBTAINING NEW SORBENTS BY POLYVINYL CHLORIDE

[1]Nurkulov Faizullo, [2]Umbarov Ibrahim, [3]Turasunnat Shomansurkhan
Tashkent Research Institute of Chemistry and Technology, dock[1], Termez State University, dock[2], Karshi Engineering - Economical Institute, lecturer[3]
nfayzulla@mail.ru[1], i umbarov@mail.ru[2], shturasunnat@.mail.ru[3]

ANNOTATION

New sorbents were synthesized by modification of polyvinyl chloride with monoethanolamine, diethyldithiocarbamate, diphenylamine, and the structure of the obtained sorbent was studied by IR spectroscopy. Using the results of IR spectroscopy and elementary analysis, the structure of polyvinyl chloride modified with monoethanolamine, diethyldithiocarbamate, diphenylamine was determined.

Keywords: polyvinyl chloride, diphenylamine, monoethanolamine, diethyldithiocarbamate, molecule, sorbent, polymer, membrane, dimethylformamide.

INTRODUCTION

Today, one of the methods of producing polymer materials in the world is the production of available polymers. Macrochain polymers, more suitable for the preparation of novel chemical products, are polymers containing reactive groups such as braids or halogens. A large number of studies on the production of polymer ligands by the production of polymer matrices, in most research works the obtained polymer ligands were used as ionizing sorbents for the isolation and concreting of metals from complex composite solutions.

For example, aminocarboxylic polymer ligands with ethylenediamine tetraacetate (EDTA) [1] and diethylenetriaminetetraacetate (DETATA) [2] groups are modified with appropriate organic reagents.

Ion exchange materials are widely used in various fields, such as pharmaceuticals, petrochemicals and hydrometallurgy, water purification. An important area is the use of ions of heavy and toxic metals, as well as ionites in the purification of natural and garbage waters from biologically active substances. One method of producing novel polymeric materials with the necessary physicochemical properties is to modify existing polymers. In particular, it is of interest to obtain ionites from polymers widely used in the national economy by producing new fertilizers based on polyvinyl chloride. Modification of polyvinyl chloride is studied in organic medium, water solutions, suspensions [3].

Literature review. The coordination properties of the polymer ligands and their practical application depend significantly on the homogeneity of the functional groups in the composition. Polyfunctional polymer ligands can create combined ligand complexes whose stability will be higher than that of compounds formed by monofunctional resins [4].

There are two approaches to the production of polymers: the first with a polycondensation mechanism, the second with a polymerization mechanism. Polemination by polycondensation involves at least three stages: formation of a copolymer with a condensation reaction, reduction of alkoxized monomers into artificial groups of the copolemer using functional trialkoxysilanes, formation of a copomer as a result of hydrolytic condensation. Production of polymers by the polymerization mechanism is technologically homogeneous, since production of polymer and introduction of its functional group are combined in one process [5-7].

Polymer ligands are widely used in hydrometallurgy as sorbents in concentrating ions of various metals, neutralizing waste solutions with heavy metal ions. Currently, a large range of ionizing, complexing polymers and polymer matrices has been developed. As is known, commercial methods for preparing such polymer

ligands are polycondensation, polymerization and copolymerization of monomers occupying various functional groups [8, 9].

To concentrate and isolate micromagnates of elements, polymer sorbents forming gelate are widely used. The further development of their use is due to the high recognition and effective action of element ions when concentrating them from complex chemical constituents of solutions. Sorbents are not toxic, are resistant to long-term storage and are convenient for transportation [10].

The coordination properties of the polymer ligands and their practical application depend significantly on the homogeneity of the functional groups in the composition. Polyfunctional polymer ligands can create combined ligand complexes whose stability will be higher than that of compounds formed by monofunctional resins [11].

In the course of our study, polyvinyl chloride was dissolved in dimethylformamide and its reaction with diethylithiocarbamate, monoethanolamine and diphenylamine was studied to modify complexing reaction active compounds. Their composition and features are determined. The composition of the obtained products was investigated using the IR spectral analysis method.

Research Methodology. Polyvinyl chloride, dimethylformamide, diethyldithiocarbamate, monoethanolamine, diphenylamines; IR spectroscopy and element analysis were performed.

Polyvinyl chloride is a colorless, transparent plastic, thermoplastic vinyl chloride polymer. In its pure form, it does not support combustion in the air, but the resistance to fire of plastic based on it depends on the additives used. At a molar mass of 62.5 g/mol, density of 1.35-1.43 g/cm3, liquid temperature of 150-220 °C, temperature above 110-120 °C, hydrogen chloride HCl is released.

Polyvinyl chloride is an environmentally friendly product with a chemical compound of carbon, hydrogen and chlorine, which contains about 43% ethylene (refined product) and 57% combined chlorine obtained from a wood salt. Also in the process of extracting the profile of polyvinyl chloride stabilizers, modifiers, paints and various additives are added, responsible for the strength of the final product, its color, resistance to ultrabinar rays, precipitates and excessive temperature [9].

Dimethylformamide is an organic compound with the formula (CH3) 2 NC (O) H, a rather viscous liquid without color. In its pure form, it has practically no smell. Molar mass - 73 g/mol, liquid temperature 61 °C, boiling point - 153 °C.

Dimethylformamide is mixed with many organic solvents except hydrocarbons. The solvent, which is often used to carry out chemical reactions and purify substances by recrystallization, has high soluble strength for both organic compounds and partially inorganic salts. It facilitates reactions by the field mechanism, is unstable under the influence of strong acids and bases, which leads to hydrolysis, especially at high temperatures [10].

IR spectroscopy - our study used the results of SHIMADZU IQ-Fourier spectrophotometer analysis (Japan) (range 400-4000 cm-1, dimensions 4 cm-1). In this analysis, when radiation is transmitted through a substance, oscillatory actions of molecules or their individual parts occur. In this case, the intensity of light transmitted from the sample is attenuated. However, absorption does not occur in the entire spectrum of incident radiation, but in wavelengths, the energy of which directly depends on the excitation energy of oscillations in the studied molecules.

Element analysis - analysis of the composition of products obtained in this research work. This analysis method is intended for qualitative and quantitative determination of elemental composition of liquid, solid and gas substances and materials. The elemental composition of the substance should be known to control the raw materials, production and finished products used in any production.

The reaction of polyvinyl chloride with the help of diethylithiocarbamate, monoethanolamine, diphenylamines was studied in order to obtain a new crop with reactive active compounds of complex origin. The composition of the obtained products was investigated using IR spectroscopy, an elementary analysis method. Also, to prove the chemical composition of synthesized sorbents, the laboratory of the Center for Advanced Technologies at the Ministry of Innovative Development of the Republic analyzed the elements and obtained the following results.

Analysis and results. The reaction with monoethanolamine in order to obtain a new crop with reactive active compounds of complex formation of polyvinyl chloride was studied and the composition of the product was investigated using the spectral analysis method IR

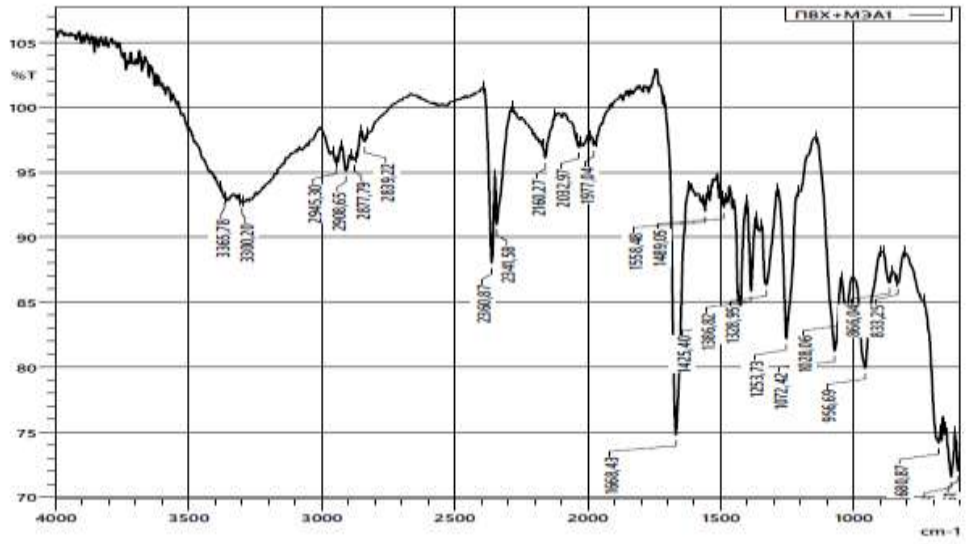


Figure 1. IR spectrum of synthesized sorbent

In the IR spectrum of the obtained complexing sorbent ν(NH)+ ν(OH) 3365 cm^{-1}, ν_{as}(NH) 3300 cm^{-1}, $\nu_{as}(CH_2)$ 2945 $см^{-1}$, H with a chain ν_{as}(OH) 2900 $см^{-1}$, (CH_2)+(CN) 1668 cm^{-1}, δ_s $(N\text{-}CH_2)$ 1425 cm^{-1}, ν(C-O) 1328 cm^{-1}, ν(C-OH) 1250 cm^{-1}, 956 $см^{-1}$.

The reaction of polyvinyl chloride with diethylithiocarbamate is studied in order to obtain a new crop with reaction active compounds of complex formation. The composition of the obtained products was investigated using the IR spectral analysis method.

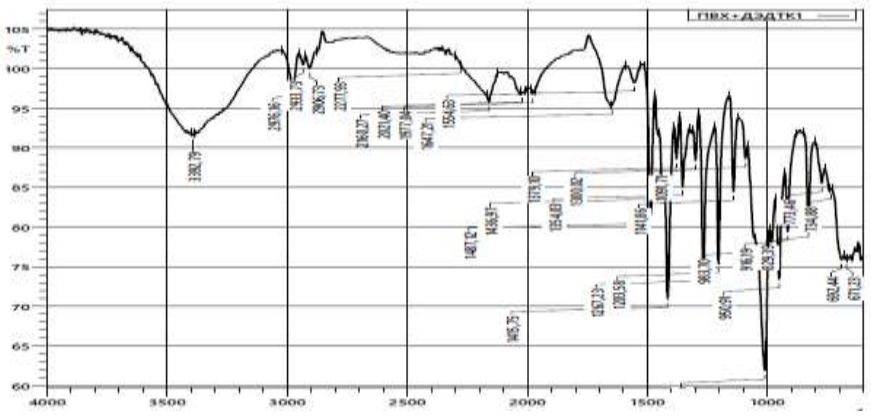


Figure 2. IR spectrum of synthesized sorbent

In the IR spectrum of the obtained complexing sorbent ν(NH) 3392 cm^{-1}, $\nu_{as}(CH_2)$ 2976 cm^{-1}, H with a chain $\nu_{as}(OH)$ 2906 cm^{-1}, (CH_2)+(CN) 1647 cm^{-1}, δ_s (N-CH_2) 1415 cm^{-1}, ν (R-SO_2-OR) 1354 cm^{-1}, ν(C-O) 1300 cm^{-1}, ν(C-OH) 1203 cm^{-1}, 950 cm^{-1}

The reaction of polyvinyl chloride with diphenylamine is studied in order to obtain complexing reaction active compounds. The composition of the obtained products was investigated using IQ spectroscopy, an elementary analysis method.

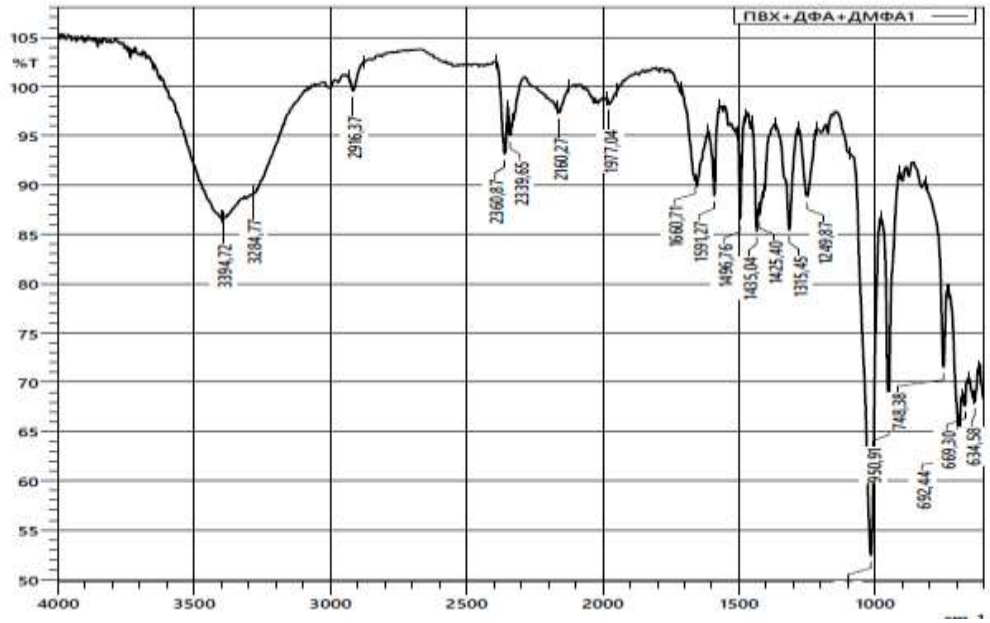


Figure 3. IR spectrum of synthesized sorbent

In the IR spectrum of the obtained complexing sorbent ν(NH) 3394 $см^{-}$, (CH_2) 2916 $см^{-1}$, (CH_2) + (CN) 1660 $см^{-1}$, δ_s (N-CH_2) 1425 $см^{-1}$, ν_s (CH_2) 1315 $см^{-1}$, ν(C-OH) 1249 $см^{-1}$, ν (C-O) 1049 $см^{-}$, ν (POC) 950

Also, to prove the chemical composition of the synthesized sorbent, the laboratory of the Center for Advanced Technologies at the Ministry of Innovative Development of the Republic analyzed the elements and obtained the following results:

Table 1

Results of elemental analysis 1-Sorbent synthesis

(10 mg in sorbent)

Chemical elements in sorbent	Theoretical		Actually	
	milligram	percentage	milligram	percentage
Nitrogen	0,61	9,29	0,60	9,21
Carbon	2,1	31,78	2,1	31,59
Hydrogen	0,39	5,96	0,40	5,82
Oxygen	0,7	10,59	0,7	10,45
Copper	2,8	42,38	2,7	42,09

Table 1 shows that the composition of the synthesized sorbents corresponds to their gross formula. Thus, by the composition and structure of sorbents with a copper (II) ion, it can be said that polyvinyl chloride is a fresh crop with the participation of monoethanolamine.

Table 2

Results of elemental analysis of synthesized sorbent

(40 mg in sorbent)

Chemical elements in sorbent	Theoretical		Actually	
	milligram	percentage	milligram	milligram
Nitrogen	3,2	8	2,96	7,4
Carbon	19,2	48	19,7	49,25
Hydrogen	2,97	7,43	2,74	6,85
Sulfur	14,63	36,57	14,6	36,5

Table 2 shows that the composition of the synthesized sorbents corresponds to their gross formula.

Table 3

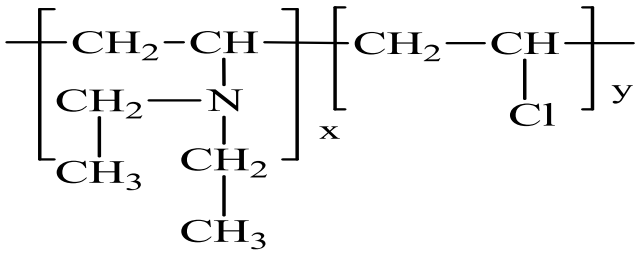
Results of elemental analysis of synthesized sorbent

(80 mg in sorbent)

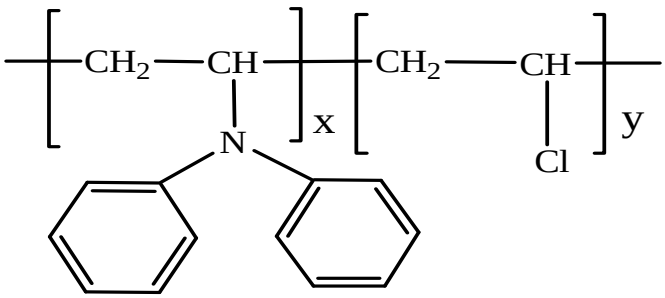
Chemical elements in sorbent	Theoretical		Actually	
	milligram	percentage	milligram	milligram
Nitrogen	5.74	7.17	5.87	7.34
Carbon	64.83	81.05	63.93	79.91
Hydrogen	5.33	6.66	5.7	7.13
Chlorine	4.1	5.12	4.5	5.62

Table 3 shows that the composition of the synthesized sorbents corresponds to their gross formula.

The proposed polyvinyl chloride structure obtained by diethylamine can be transferred as follows:



The proposed polyvinyl chloride structure obtained by diphenylamine can be summarized as follows:



Output. From the analysis, it can be concluded that reaction mixtures of polyvinyl chloride, monoethanolamine and dimethylformamide, polyvinyl chloride, diethylithiocarbamate and dimethylformamide, polyvinyl chloride, diphenylamine and dimethylformamide are formed. As a result of the studies, a technique for producing sorption material by modifying polyvinyl chloride with monoethanolamine, diethylithiocarbamate, diphenylamine has been developed. The chemical composition and the proposed structure of the sorbent were determined using elementary analysis and IR-Fourier spectroscopy methods.

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