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Development of Sorption Technology of Composition Polymer Sorbents

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ABSTRACT. Results of researches of studying of regularities of process of interaction of polyaniline with polyacids, developments of effective structures and technology of receiving new composite polymeric sorbents, studying of their physical and chemical and operational properties are shown. Polymer-polymeric composites on the basis of polyaniline with polyacids are very perspective and can take the important place in technology of purification of industrial waters as they find a number of properties which cannot be provided with others organic and inorganic solid substances

KEYWORDS: Polyaniline, bentonite, distilled water, emeraldine, composition, sorbent, ammonium persulphate, alkali, hydrochloric acid, aniline, acrylic acid, polykapramide.

I. INTRODUCTION

Electro conductive polymer-polymeric compositions on the basis of polyaniline have a complex of valuable properties, such as improved chemical, electric, mechanical and technological. It considerably caused the prospect of their practical application. They can not only compete with traditional materials in the field of electronics, optics, catalysis, but also include possibilities of creation of materials with the new fields of use [1].

Recently the increasing attention is drawn by the processes proceeding with participation of diverse macromolecules and which are formed at the same time polymer-polymeric complexes. Studying of reactions a macromolecule – a macromolecule is, in essence, the new, intensively developing field of chemistry of high-molecular connections [2].

The research polymer – polymeric interactions is important, both with scientific-theoretical, and with practical the points of view. Products of these reactions (polymer – polymeric complexes) have unique properties, significantly different from properties of initial components, and already now are applied in the equipment, medicine and various fields of the industry.

Therefore development effective polymer - polymeric sorbents for extraction of non-ferrous and precious metals from sewage of metallurgical industry is a relevant task.

Methods and materials. On the basis of the chosen purpose and an objective of researches we chose as objects of researches aniline, acrylic acid, polykapramide, bentonite, etc.

Aniline of the brand [KhCh], chemical formula $C_6H_5NH_2$, molecular weight 93,2g; temperature of boiling $+184,46^{\circ}C$; melting temperature $-6,2^{\circ}C$; density $d=0,9986\text{ g/cm}^3$.

Aniline belongs to group of arilamine. It has a peculiar smell, at the room temperature it is colorless liquid, under the influence of light can gain weak yellow color. Under a vacuum it is overtaken at a temperature $-91^{\circ}C$. In IR spectrum valent fluctuations $N-H$ of communication of aniline are in area of $1180-1360\text{ cm}^{-1}$, in the field of $3200-3500\text{ cm}^{-1}$ valent fluctuations amplify, resonance, $\delta = 1-5\text{ mn}$. Aniline is strongly toxic, the care at its use is required.

Acrylic $CH_2=CHCOOH$ acid, molecular weight 72,06; temperature of boiling $140,96$; liquid with a pungent smell, melting temperature $+13^{\circ}C$.

We chose the acrylic acid of the (KhCh) brand stabilized by hydrochinone [3]. It was subjected to careful chemical cleaning, processed 5% three times solution of caustic potassium in a dividing funnel before disappearance of a reddish shade. Then repeatedly washed with the distilled water before neutral reaction on litmus. The acrylic acid

purified thus was frozen for removal of water. After that carried out double fractional distillation in a vacuum with a residual pressure of 15 mm Hg, selecting fraction at a temperature of boiling 48,5⁰C with density d-1,0150 g/cm³.

II. SIGNIFICANCE OF THE SYSTEM

Recently the increasing value various complex connections buy polymer-polianiline and composite materials on their basis. In particular, it is necessary to carry so-called interpolymeric complexes and compositions on their basis to them. They have unique properties and therefore technologists, medicine and other branches of economy are widely applied in electronics, chemical[4]. The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. METHODOLOGY

Researches of processes of receiving the polyaniline complexes and composite materials on their basis having important electrochemical properties is intensively developing field of chemical technology now. It is necessary to specify that polianiline have good stability and they can easily be received, both chemical, and electrochemical methods. This circumstance also served as an important prerequisite to development of researches on search of new and purposeful processes of modification of the existing methods of receiving polianiline [5].

IV. EXPERIMENTAL RESULTS

For expansion of a scope of composition on the basis of polyaniline and polyacids we received and investigated compositions of three types: a) on the basis of electro conductive polyaniline and binding materials; b) on the basis of the electro ruling and doping polymers; c) the self-doped polymeric compositions.

In the first case receiving composition polyaniline – polykapramide was carried out by an electrochemical way in solution of organic acid (formic acid) which in this case was at the same time and solvent of a polykapramide (PKA) and a dopant of polyaniline (PANI) (table 1).

Results of researches showed that with increase in concentration of a polykapramide in the reactionary environment increase in adhesion to a glass electrode and hardness of a covering on the pearl device (table 2) is observed. The conductivity of composition at the same time decreases[6].

Table 1. Electrophysical and physicomechanical properties of the composite coverings received in the electrochemical way

Aniline: polykapramidemol/mol	Conductivity of a covering on Om ⁻¹ .sm ⁻¹	Hardness in accordance	Adhesion by a method of cage cuts
4:1	2,3·10 ⁻¹⁴	0,60	1
4: 2	0,8·10 ⁻⁸	0,80	1
4:3	0,3·10 ⁻⁶	0,85	1
4:4	0,2·10 ⁻⁵	0,89	2
3:4	0,1·10 ⁻⁴	0,90	2
2:4	0,05·10 ⁻³	0,90	3
1:4	0,025·10 ⁻²	0,93	4

Table 2. These adhesions of the received PKA/PANI sheet by a method of trellised cuts

Points	1	2	3	4
The exfoliated cages, %	0	up to 5	5-35	35-100

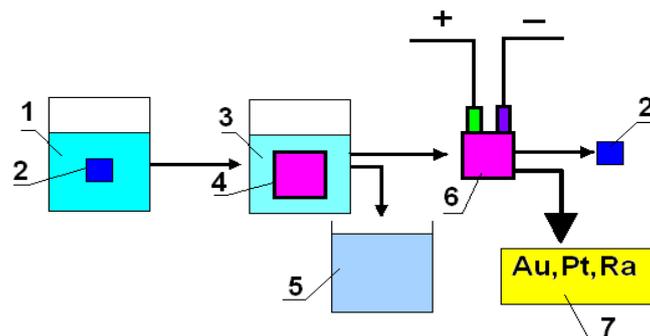
Despite rather small period of an intensive research polymer - polymeric compositions and composition on the basis of polyaniline with polyacids, the uniqueness and an originality of their properties (physicomechanical, electro conductive, etc.) caused attention to questions of practical use polymer–polymeric materials on the basis of polyaniline.

About uses of composite sorbents of polyaniline for disinfecting of sewage of the industry. Polymer–polymeric complexes are very perspective as a number of properties which cannot be provided with other organic and

inorganic solid matter is found in them. Now a problem of purification of the polluted industrial waters and also disinfecting's of exhaust gases acquire important ecological relevance. The existing methods and conditions of utilization of sewage not completely satisfy the put requirement before them. In this regard studying polymer-polymeric sorbents and a gelinterpolymer of materials as the cleaning component in processes of purification of the polluted waters acquire special relevance.

By us it was studied interaction processes polymer-polymeric composite materials with solutions of the containing ions of metals. The research was shown that at immersion of interpolymer hydrogel in the purified water solution, effective sorption of ions of metals with education threefold an interpolymer of a metal complex proceeds. As a result of sorption threw ions deep into of gelinterpolymer material, more considerable is observed swellings and characteristic change of color of gelinterpolymer material.

This bulking up polymer-polymer metal complex formation of an electro contracted that gives the chance easily and just to take sorption metals. It is shown the scheme of implementation of purification of industrial water of figure 1 below. At first prepare gel of interpolymer material on recalculation to contents an ion of metals as a part of the purified water solution. The prepared gelinterpolymer material (2) is placed in the capacity of the purified water solution (1). Then begins, process of clarification of the water (3) and swellings a gelinterpolymer of material (4). It should be noted especially that in the course of swelling capacity color of the product received a gelinterpolymer metal changes (1). After completion of process separate purified water (5) and in the course of an electro contraction (6) separate sorption metal (7) from a gelintermaterial.



- 1) Industrial water 2) gelinterpolymer complex 3) purified water 4) the bulked up gel 5) the collection cleaned waters 6) electrolysis gel of a product 7) the received metals

Fig 1. The scheme of purification of industrial water in the presence of gelinterpolymer material

At the same time the prepared gelinterpolymer material borrows initial volume. The purified gelinterpolymer material has places of repeated use [7]. The dried-up products of materials are elastic and capable (reversibly) will be extended, on 500 times at the same time their conductivity in proportion changes. It became clear that polymer-polymeric materials with the sewed polyacids in solutions form polymer-metal-polymeric connection, at the same time occurs intensive occluded ions of heavy radioactive and non-ferrous precious metals of which to result extraction of the last.

V. CONCLUSION AND FUTURE WORK

Thus, the research of a product of interaction of the polyaniline received from withdrawal aniline sulfate to skin of processing industry with the linear and sewed polyacids established chemical structure polymer-polymeric compositions received on their basis. It is shown that polymer-polymeric composites on the basis of polyaniline with polyacids are very perspective and can take the important place in technology of purification of industrial waters as find a number of properties which cannot be provided with others organic and inorganic solid substances. Polymer-polymeric complexes of polyaniline with hydrogels effectively occlude from industrial waters of heavy radioactive, non-ferrous metals and has property of an electro contracted that gives availability full of utilization of industrial waters and obtaining enormous economic effect.

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