STUDY OF INORGANIC COMPOUNDS FOR THE PRODUCTION OF SYNTHETIC

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Abstract.

The article is devoted to the study of the influence of technological parameters on the optimal technological parameters for obtaining burkeite by salting out soda ash from purified solutions of natural mirabilite of the Republic of Uzbekistan.

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Introduction.

It is impossible to imagine the development of the economy in the world without the chemical industry, the industries of which must be based on high technologies, and the manufactured products must meet world standards according to the nomenclature. Therefore, the modernization of the chemical industry and the localization of the raw material base of manufacturing enterprises are relevant.

Today in the world it is important for the localization and use of raw materials for the production of non-phosphate, environmentally friendly and high-quality detergents with high functional value based on natural organic and inorganic substances, the following scientific solutions can be substantiated: to determine the optimal conditions for the mirabilite purification process; determination of the main technological factors influencing the process of obtaining soda ash, burkeite and ammonium sulfate; theoretical substantiation of complex processing of chlorine-free fertilizers into ammonium sulfate; creation of technology for the synthesis of burkeite based on sodium sulfate and carbonate.

In the Republic of Uzbekistan, as a result of extensive scientific research and technological development, certain results have been achieved for the production of detergents based on local resources and waste. In this regard, productively using local raw materials, the technology for the production of sodium bicarbonate, burkeite and ammonium sulfate from the sulfate salts of Karakalpakstan has great importance [1].

Composition and quality Synthetic detergents are determined by the purpose and method of its production, the presence of active additives, the solubility and compatibility of components, etc. and, of course, the properties of surfactants. Synthetic detergents are subject to strict requirements for their biodegradability. Synthetic disinfectant detergents use quaternary ammonium salts of primary, secondary, and tertiary amines, and, more recently, amine oxides. Many types of bulk raw materials are supplied to enterprises producing synthetic detergents: sodium tripolyphosphate, sodium sulfate, sodium carbonate and bicarbonate, sodium perborate and percarbonate, carboxymethyl cellulose, magnesium sulfate, optical brighteners, enzymes, gelatin or casein, trilon B, calcium chloride , sodium hydroxide [2]. If burkeite - $Na_2CO_3 \cdot 2Na_2SO_4$ is used, a number of technological actions that can be obtained from local raw materials of Uzbekistan will be reduced.

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The aim of the research is to create a resource-saving waste-free technology for obtaining burkeite and ammonium sulfate by converting sulfate salts of Karakalpakstan with ammonium bicarbonates.

The object of research is the mirabilite of the Tumryuk deposit; soda ash LLC "Kungrad Sodvy Zavod", ammonium carbonate salts, sodium bicarbonate conversion products, ammonium sulfate and burkeite.

The subject of the research is the development of a technology for the complex processing of natural mirabilite by conversion and salting out methods to obtain burkeite, sodium bicarbonate and ammonium sulfate.

The process of sodium sulfate conversion by ammonium carbon salts was studied using thermodynamic analysis and solubility isotherms of three- and four-component reciprocal systems $2NH_4^+$, $2Na^+//2HCO_3^-$, SO_4^{2-}-H_2O at temperatures of 30 and 70°C. Solutions of natural mirabilite were purified by the lime method in the presence of circulating carbonate-sulfate solutions and the nature of the influence of input technological parameters on the analytical parameters of the process of obtaining sodium bicarbonate and burkeite by conversion methods was determined. The secondary product of the conversion is ammonium sulfate. The study showed that the process of evaporation of mother liquors with the production of ammonium sulfate in the range of variation of technological parameters determined from the system NH_4^+ //1/2SO_4^{2-}-H_2O [3].

The rheological properties of solutions and suspensions formed in the intermediate stages and the mineralogical compositions of solid sediments and products using modern physico-chemical methods of analysis are shown in Table 1.

Table 1

The evaporation of the resulting solution by mirabilite conversion and ammonium bicarbonate (liquid phase) and its rheological properties

№	Degree of parka, %	Ratio L:S in suspension	Rheological properties of suspension							
			Density, g/cm^3				Viscosity, cps			
			Temperature, °C							
			20	40	60	80	20	40	60	80
At the concentration of the circulating solution 0%										
1	10	81,51	1,23	1,22	1,21	1,20	3,39	2,13	1,89	1,056
2	20	24,71	1,27	1,25	1,23	1,21	6,46	2,22	1,91	1,12
3	40	4,88	1,38	1,37	1,34	1,27	8,45	3,19	2,85	1,46
4	60	0,37	1,65	1,52	1,44	1,35	10,14	6,58	5,01	3,52
При концентрации оборотного раствора 10%										
1	10	18,05	1,24	1,23	1,23	1,22	4,16	2,89	2,33	1,85
2	30	1,83	1,26	1,25	1,24	1,23	9,45	5,11	4,81	3,06
3	50	1,27	1,37	1,33	1,31	1,29	11,89	7,45	5,87	4,56

Thus, by evaporation of the mother liquor formed during the conversion of a purified solution of natural mirabilite with ammonium bicarbonate, pure ammonium sulfate and circulating solutions containing ammonium sulfate, sodium and sodium carbonate can be obtained.

Methods of physical and chemical analysis. In the practice of soda production, the total and combined ammonia, total chlorine and total carbon dioxide are usually determined analytically in the liquid phase. For convenience of presentation, we introduce the following notation, which express the

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concentrations of the corresponding substances in normal divisions (1 normal division is equal to 1/20 gram equivalent per 1 liter of solution).

The study of the solubility of water-salt systems was carried out by the isothermal method by mixing at a constant temperature the solutions of the studied salts while maintaining a sufficient amount of solid phases in the mixture.

The experiments were carried out in a parabolic flask with a stirrer placed in a thermostat, the temperature in which was maintained by a thermostat and a contact thermometer with an accuracy of ± 0.1°C.

After equilibrium was established, samples of the liquid and solid phases were taken for chemical analysis and the location of the figurative point of the system was determined. The solid phase was determined by the Skreinemakers residue method.

X-ray phase analysis was performed on a DRON-3 diffractometer with a voltage of 35 kW, an anode current through the tube of 8 mA, and a maximum counter rate of the ratemeter of 400 mm p/s.

Samples selected from the solubility diagram of the Na_2CO_3-Na_2SO_4-H_2O system were studied by X-ray analysis. The samples were visualized using a microscope (Leica, Germany) controlled by a computer. The optical system of the Leica DM500 microscope includes a lens, an eyepiece and a lighting device - a condenser with a diaphragm with a light filter and an electric illuminator. Optical binocular microscope Leica DM500 gives an increase in the range from 4 to 100 times. The magnifications of the lens are indicated by numbers on the handle - x4, x10, x40, x100 [4].

The experimental results showed that the suspension filtration rate is very high and amounts to 21800 and 24950 kg/m^2·h at 90 and 70°C, respectively. Therefore, the resulting suspension without settling is directly fed to the filtration stage.

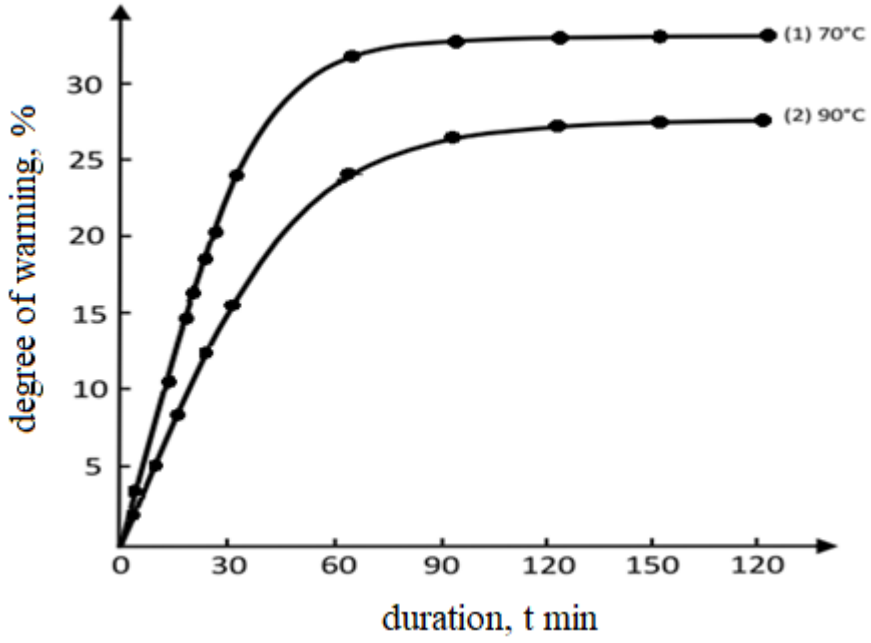

Fig.2. The degree of clarification of the burkeite suspension depending on the duration of settling.

Studies have shown that upon receipt of burkeite L: S in the system can vary in the range of 1.5-6. Therefore, the rheological properties of the suspension were studied in these intervals L:S (Table 2). The table shows that, in the studied intervals of variation of the initial parameters, the density and viscosity fluctuate within 1.336-1.701 g/cm3 and 2.5-46.39 cPs, respectively [5].

Table 2.

Rheological properties of burkeite solutions at different ratio L:T dilution

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№	L:S	ρ, g/ml				μ, spz			
		20	40	60	90	20	40	60	90
Burkeite obtained at 70°C									
1	6:1	1,324	1,368	1,336	1,312	14,06	4,85	3,41	2,54
2	4,5:1	1,413	1,404	1,380	1,344	17,27	5,06	4,36	3,19
3	3:1	1,472	1,461	1,428	1,408	25,64	6,61	5,42	4,44
4	1,5:1	1,532	1,520	1,508	1,496	27,75	7,36	6,52	5,20
Burkeite obtained at 90°C									
	6:1	1,363	1,352	1,340	1,333	17,52	5,67	4,65	3,67
	4,5:1	1,381	1,366	1,359	1,349	28,91	7,11	5,04	3,96
	3:1	1,522	1,437	1,425	1,411	40,12	8,48	5,88	4,07
	1,5:1	1,701	1,589	1,581	1,578	46,59	9,55	6,83	4,50

These data show that the resulting slurry has good fluidity and filterability.

The feasibility study carried out by us showed the high efficiency of organizing the production of complex processing of natural mirabilite with the production of sulfate-containing materials on the basis of Kungrad Soda Plant LLC.

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