TECHNOLOGY FOR OBTAINING COAGULANT FROM ALUMINUM OXIDE RAW MATERIALS

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Abstract: *The main focus is on the synthesis of polyaluminum chloride coagulant from local raw materials containing aluminum oxide. The developed technology includes alkaline hydrolysis and subsequent acid treatment stages, which allows for the effective use of technogenic waste and reduces environmental impact. The chemical nature and amorphous structure of the resulting coagulant were confirmed by IR spectroscopy analyses. This work is aimed at solving urgent problems related to water purification, resource conservation, and the introduction of environmentally friendly technologies.*

Keywords: *Aluminum sulfate, water, oxychloride, flow.*

Annotasiya: *Sanoatda alyuminiy saqlovchi chiqindilarini utilizatsiya qilishning ekologik va texnologik jihatlari ko‘rib chiqilgan. Asosiy e’tibor aluminiy oksidi saqlovchi mahalliy xomashyodan polialuminiy xlorid koagulyantini sintez qilishga qaratilgan. Ishlab chiqilgan texnologiya ishqoriy gidroliz va keyinchalik kislotali ishlov bosqichlarini o‘z ichiga oladi, bu esa texnogen chiqindilarni samarali qo‘llash va atrof-muhit yakuni kamaytirish imkonini beradi. Olingan koagulyantning kimyoviy tabiati va amorf tuzilishi IK-spektroskopiya tahlillar orqali tasdiqlangan. Ushbu ish suvni tozalash, resurslarni tejash va ekologik toza*

texnologiyalarni joriy etishga qaratilgan dolzarb muammolarni hal etishga yo'naltirilgan.

Аннотация: *Рассматриваются экологические и технологические аспекты использования отходов алюминиевых складов в промышленности. Основное внимание уделяется синтезу полиалюминиевого хлоридного коагулянта из местного сырья, содержащего оксид алюминия. Разработанная технология включает щелочной гидролиз и последующие стадии кислотной обработки, что позволяет эффективно использовать техногенные отходы и снижает воздействие на окружающую среду. Химическая природа и аморфная структура полученного коагулянта подтверждены анализом ИК-спектроскопии. Данная работа направлена на решение актуальных проблем, связанных с очисткой воды, ресурсосбережением и внедрением экологически чистых технологий.*

Annotation: This article examines the environmental and technological aspects of industrial utilization of aluminum warehouse waste. The focus is on the synthesis of a polyaluminum chloride coagulant from locally available aluminum oxide-containing raw materials. The developed technology involves alkaline hydrolysis followed by acid treatment, enabling the efficient use of industrial waste and reducing environmental impact. The chemical nature and amorphous structure of the resulting coagulant are confirmed by IR spectroscopy analysis. This work aims to address current issues related to water purification, resource conservation, and the implementation of environmentally friendly technologies.

The sintering method is to mix the ore, hydroxide powder and limestone, then the aluminum oxide in the ore is sintered at high temperature to form solid sodium aluminate, the iron oxide hydrolyzes to form sodium ferrite, silica and calcium oxide to form insoluble calcium orthosilicate, and then use a dilute alkali solution to dissolve the sintered clinker, so that the sodium aluminate enters the solution and is

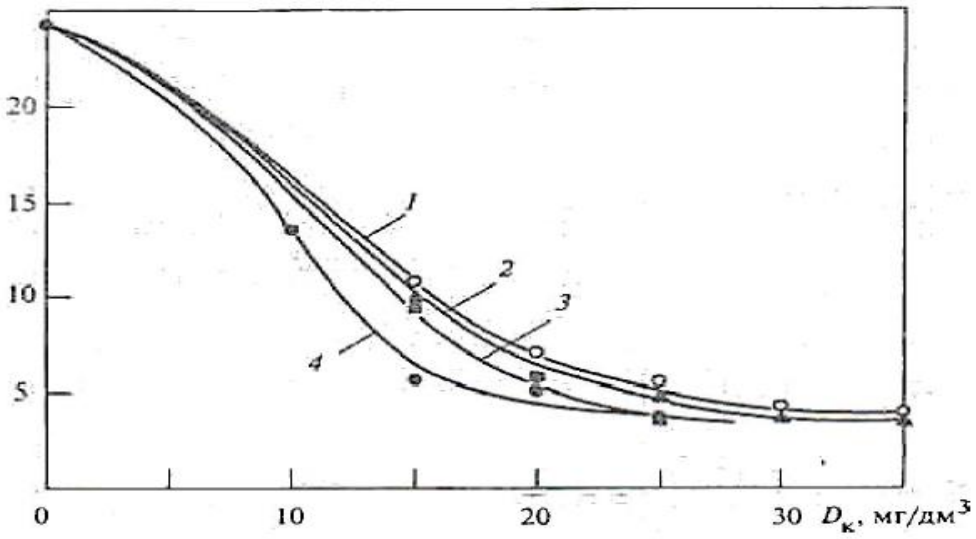
separated from the red clay. The sodium aluminate standard solution is obtained after drying from the solution containing part of the silica. By introducing carbon dioxide and gas to decompose the refined solution, the aluminum hydroxide and mother liquor can be improved. After the mother liquor is evaporated, a little suitable hydroxide powder is added to sinter with the next batch of ore and lime. Washed aluminum hydroxide. Calcined to obtain Chinese aluminum oxide.

2. **Experimental. Quality indicators of purified of purified water**

Indicator	Alkalinization, coagulant			
	Nominal value $AL_2(SO_4)_3$	**Nominal value**	**Minimum**	**absence**
J, mg-ekv/dm^3	1.0	1.04	1.0	1.0
W, mg-ekv/dm^3	0.03	0.45	0.29	0.3
Ok, mgO/dm^3	5.2	6.4	4.2	3.8
PH	5.3	6.79	6.2	6.4
Concentration mkg/dm^3				
Al	-	100	20	85
Fe	60	55	38	36.5

Such changes in the quality of purified water also affect its stability. The table presents the results of laboratory experiments on coagulation for the studied coagulants, as well as the calculated values of the stability index. From the analysis of its data it follows that water treated with $A1_2$ $(S0_4)_3$ has low pH values and the highest negative stability index, that is, water is very aggressive. The quality of water coagulated with aluminum oxychloride oxide is characterized by high pH values and

less aggressiveness. The differences in the quality of water determined with aluminum oxychloride oxide [2/3 (100 %)] and a mixed coagulant are insignificant. Therefore, for industrial tests, a cheaper coagulant with a basic module [2/3 (100 %)] produced by Boksitogorsky Alumina OJSC is recommended. The main purpose of experimental and industrial tests using OCA is to test the coagulation technology in three ways.



Changes in the oxidability of treated water depending on the dose of various coagulants

With a nominal alkalinity of the source water $Al_2(SO_4)_3$ corresponds to the dosing regimen. With minimal alkalinity and in the absence of initial alkalinity, instead of aluminum oxychloride OCA with a basicity module of 2/3, which is supplied to the Pskov GRES for coagulation, the reagent is supplied with a basicity module of 2/3, as shown by the control of the inlet of the reagent (2/3 (46 %), less than 4 + 1/3 of the recommended one. The supply of such OX to the clarifier with a dosage of 1 mg-eqv / dm should theoretically reduce Schna by 0.48 mg-eqv / dm. However, with a low initial alkalinity of the water, due to the incomplete hydrolysis process, the change in Sc is less. The increase in the concentration of chlorides is proportional to the dose of the coagulant and is approximately 0.6 mg-eqv / dm due to the presence

of NaCl impurities, changes in the alkalinity and concentration of chlorides, as shown by laboratory studies, will be significantly greater, and the pH is lower than if the OCA with a basicity modulus of 2/3 was used. Therefore, for a given water, the indirect indicator that determines the value of DK will be the change in the concentration of chlorides, and not the alkalinity. During the tests, a coagulant was added to the source water in front of the air separator, and polyacrylamide was added to the conical part of the clarifier in all modes. At the first stage of the study, the optimal dose of OH was determined during the preliminary alkalization of the source water and the hydraulic properties of the sludge were determined; at the second stage, the operating mode of the clarifier and the quality of the coagulated water with minimal alkalization were analyzed; at the third stage, the optimal and minimum doses of OH without alkalization were determined. During the tests, operational control of the coagulant dose (by increasing the concentration of chlorides and the actual consumption of the coagulant solution from the measuring tank), the operating mode of the slurry filter, the quality of the source water and the main indicators of the coagulant water in the mixing zone and at the outlet of the clarifier were carried out by increasing the concentration of chlorides and the actual consumption of the coagulant solution from the measuring tank), the operating mode of the slurry filter, the quality of the source water and the main indicators of the coagulated water in the mixing zone and at the outlet of the clarifier. A comparison of the quality of clarified water during the coagulation of OH and $Al_2 (S0_4)_3$ shows that there are no obvious advantages in terms of such indicators as the concentration of Fe, Al, $Si0_2$ and oxidability. At the same time, when using OHA, clarified water is characterized by higher rH values, less aggressiveness and a decrease in the total salt load on ionite filters. A comparison of the results obtained at almost equal doses of coagulants and alkali 0 sh showed that the dosing of OHA allows you to get water with less aggressiveness: the pH of clarified water is 6.69, and when using $A1_2 (S0_4)_3$ - 5.3. In the mode with minimal alkalinization, the water quality during the

coagulation of OCHA is almost by all indicators, it is higher than with the existing technology. Complete elimination of alkalinization also makes it possible to obtain high-quality water with a rH= 6.16...6.35 at doses of OHA equal to 1.7.. .1. 2 mg-eq/dm^3. The transition to aluminum oxychloride coagulation in all modes did not lead to violations of the clarifier; the sludge filter functioned stably. A comparison of the quality of clarified water during the coagulation of OH and $Al_2(S0_4)_3$ shows that there are no obvious advantages in terms of such indicators as the concentration of Fe, Al, $Si0_2$ and oxidability. At the same time, when using OHA, clarified water is characterized by higher rH values, less aggressiveness and a decrease in the total salt load on ionite filters.

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