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Efficiency of Using Apatite in Obtaining Epa

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ABSTRACT

The industry for the production of mineral fertilizers is widely developed in our country. However, it is necessary to continue scientific work in order to increase the level of assimilation by the plant, economically use raw materials and ensure the quality of the fertilizer.

At present, organic, mineral and organomineral types of fertilizers are used in agriculture, among which the leading place is occupied by complex fertilizers containing assimilable phosphorus. The necessary raw material for this is the phosphorite of the Central Kyzyl Kum, which is considered poor among phosphorites containing fluorine. To obtain phosphate mineral fertilizers, additional processing of phosphorites by enrichment is required. Therefore, in the technological direction for its enrichment, the method of increasing the amount of phosphorus in the composition of phosphorite is used. If apatites with a high phosphorus content are used, then in practice one can see that they can be enriched relatively cheaply [2, 6].

The Central Kyzylkum phosphorites used for the production of phosphate fertilizers are local, which is convenient for production. However, the content of phosphorus in it is 14-16%, the amount of phosphorus is increased in relation to the total mass of this phosphorite, using the enrichment method by reducing the content of excess substances due to additional processing. Through the use of this method, it is possible to obtain from them the concentration of extractive phosphoric acid (EPA) up to 22-28% at the primary stage [1,2,4,5].

However, it is important to speed up the filtration process of the extraction pulp, i.e., to increase labor productivity in the extraction of phosphorites in the Central Kyzylkum, to increase the level of filtration. This requires 4 hours or more during the extraction of phosphorites. The main reason for this is to increase the level of crystallization of the phosphogypsum formed in it, that is, to ensure the growth of crystals.

First of all, the high magnesium content in phosphorite destroys the crystals in the extraction pulp during filtration, so the researchers used for this purpose methods of adding apatites with a high phosphorus content and a low magnesium content in a certain amount [3,5]. They reasoned that the effectiveness of this work was significant. Our studies show the practical significance of the extraction process of extracting phosphoric acid by adding one third of apatite with a magnesium content of 0.2% to the phosphorites of the Central Kyzylkum, containing 1.18% magnesium.

Laboratory work was carried out in a laboratory setup with a simple glass reactor, a water cooler from the evaporation of water as a result of the reaction and an electric stirrer, by gradually adding sulfuric acid to the phosphorite of the specified sample. Thermal concentrate of phosphorites of the Central Kyzylkum for laboratory work (composition: - 25.73%; - 49.87%; - 2.48%; - 1.18%; - 2.76, - 3.46%; - 5.01 %), apatite concentrate (composition, %: - 39.1; - 50.6; - 0.20; - 1.48; - 2.97 in n.d. - 1.3.) [3.7, 8] and 93% sulfuric acid. The stoichiometric norm of sulfuric acid was set equal to 100% by the amount necessary for the decomposition of calcium in phosphorite, and brought to an aqueous solution of the appropriate concentration. It is known that L:T for a given extraction process on an industrial scale should be at least 2.5:1. The main reason for this is that it is necessary to create a wide possibility of mixing the extraction mixture - pulp. Therefore, a defensive solution was used to ensure this ratio [8].

In the general case, when it interacts with sulfuric acid taken for the reaction - phosphorite - the following process is observed:

It is known that in addition to the basic phosphoric acid, which is formed during the acid decomposition of phosphorites, dihydro- and calcium hydrophosphates are formed -. For the experiment, first, phosphorite - in the Central Kyzylkum, then by adding phosphorite and apatite, EPA was obtained. According to the results of the studies, the composition of the EPA was as follows:

Table I. The chemical composition of EPA obtained from phosphorite

№	P_2O_5	H_2SO_4	CaO	MgO	Al_2O_3	Fe_2O_3	F
1	27,52	0,21	0,52	1,20	1,90	1,38	2,21
2	27,59	0,25	0,50	1,16	1,92	1,33	2,24
3	27,72	0,27	0,49	1,13	1,87	1,32	2,26

Table II. The chemical composition of EPA obtained by adding apatite to phosphorite

№	P_2O_5	H_2SO_4	CaO	MgO	Al_2O_3	Fe_2O_3	F
1	32,43	0,15	0,53	1,00	1,88	1,32	2,25
2	32,55	0,14	0,45	0,96	1,85	1,30	2,30
3	32,41	0,19	0,53	1,85	1,90	1,29	2,28

The results of the experiment were studied by the methods of chemical and physico-chemical analysis. Particular attention was paid to the extraction pulp. This was checked every 30 minutes by microscopic analysis. Firstly, in the study of crystals formed in the pulp during the extraction of phosphorite from the phosphorite itself, the crystals in the first 30 minutes, 1 hour had a crystal size of 40 x 15 microns and 80 x 30 microns, and after 4 hours the average crystal size was 280 x 80 μm ÷ 240 x 70 μm.

In the process of extraction by adding apatite to phosphorite in the study of crystals formed in the pulp in the first 30 min and 1 hour, crystals 40 x 15 μm and 80 x 30 μm, crystals 85 x 30 μm in the first 30 min, 380 x 80 μm ÷ 240 x 70 after an average of 4 hours. It was found that the total crystal size is larger. In contrast to the previous experiment, it was found that 400 x 80 μm

crystals were also present [3,8,9].

Most importantly, with increasing crystal size, an increase in the degree of pulp filtration was observed. It has been observed that filtration of apatite-containing pulp under normal laboratory conditions is better than that of phosphorite pulp. If viewed on an industrial scale, the concentration of EPA obtained by adding apatite to phosphorite up to 32% expands the possibilities of its use in the production of high-quality fertilizers, that is, it is possible to obtain a phosphorus fertilizer with a high concentration without additional processing of the received EPA.

Thus, the low magnesium content of apatite plays an important role in the growth of phosphogypsum crystals during their extraction. It is especially advantageous to create the possibility of using apatites in the production of concentrated phosphate fertilizers. And the quality of fertilizer plays an important role in improving productivity and ensuring safety.

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