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ADVANTAGE OF SEPARATING THE RESIDUE GENERATED BY THE CONCENTRATION OF THE EXTRACTABLE PHOSPHORIC ACID

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Abstract

This article is equipped with a precipitate that occurs during the concentration of EFC and its negative impact on this process, as well as the main properties of this precipitate, the role of calcium and magnesium in its property, based on an experiment shown using TPA.

Keywords: national economy, fertilizer, EFC, TPA, mineral fertilizers, nitrogen, phosphorus, potassium, calcium, magnesium, sediment, fluidity, concentration, evaporation, evaporation, thickening.

One of the main sectors of the national economy is agriculture, which currently faces many problems. The main reason for this is the lack of the required amount of fertilizer for crops. That is why, in order to solve the problem of fertilizers, a lot of work is being done to increase their quantity in various ways. One of the main sectors of the national economy is agriculture, which currently faces many problems. The main reason for this is the lack of the required amount of fertilizer for crops. That is why, in order to solve the problem of fertilizers, a lot of work is being done to increase their quantity in various ways.

Particular attention is paid to the quality indicators of fertilizers in the production of mineral fertilizers in order to increase the level of digestible form in the soil of such elements and substances as phosphorus, potassium, nitrogen, in order to increase crop yields. To do this, it is important to change the properties of the substances contained in the fertilizer in order to combat the leaching of the containing substances into the fertilizer during the irrigation period.

An important role in the implementation of these tasks; along with other agrotechnical methods, it is given to the effective use of mineral fertilizers. To obtain a highly concentrated fertilizer, concentrated extractive phosphoric acid (EFC) is required. In the process of obtaining EFC at various stages of the technology (in the extractor, filtering equipment, storage tanks, storage tanks, etc.), a significant amount of salt deposits is formed, the chemical and phase composition of which is determined mainly by the mineralogical composition of the initial phosphate raw material supplied for processing, and technological mode of extraction . Data on the phase composition of sediments are necessary to assess the possibility of processing phosphate raw materials into high-quality EFC, and also play a significant role in the implementation of the process of evaporation of weak EFC in order to obtain concentrated acids for the production of phosphorus fertilizers (ammophos, double superphosphate, liquid complex fertilizers, etc.).

In connection with the foregoing, using chemical analysis and methods of physicochemical study of solid phases (X-ray, thermography and IR spectroscopy), we studied the chemical and phase composition of sediments crystallizing from EFC based on Kyzylkum phosphorites.

The problem of fertilizers is in the first place in the development of agriculture. Because, firstly, there is no shortage of organic fertilizers, which are considered basic, and secondly, to replace them, it is necessary to introduce effective methods for obtaining mineral fertilizers from local phosphorites.

After the subsequent evaporation of EFC, it retains satisfactory physicochemical properties, in contrast to EFC from Karatau phosphorites up to a content of 53–55% P_2O_5.

There are several different ways to purify EFC from various impurities, and those with low concentrations are more difficult to purify than those with high concentrations. Because the total amount of precipitation will be very small. In addition to these, for chemical analysis, the precipitate is separated and purified with acetone based on analytical methods. When acetone is added to the precipitate, the EFC residues mixed with this type of impurities are washed out, i.e. leave the sediment, and in its composition magnesium, calcium, strontium or their compounds are purified. In this case, the precipitate is mixed with acetone and filtered, and the composition of the precipitate obtained is analyzed. The chemical analysis of the thus purified precipitate is given below in the 1-table:

1-table

CaO	MgO	Al_2O_3	Fe_2O_3	P_2O_5 common	F	Na	K	Sediment
18,43	1,36	2,11	0,93	8,94	0,61	-	-	From EFC 28,0 % P_2O_5 after 1 day
7,31	5,03	5,72	4,62	16,33	20,96	6,75	6,98	From EFC 28,0 % P_2O_5 after 3 day

As can be seen from the table, 18.43% CaO of the precipitate that fell in 1 day falls to 7.31% after 3 days, i.e., in the dissolved state, it returns to the acidic composition. The number of all other elements will increase. Especially within 1 day, sodium and potassium practically remain in the EFC . In the second type of precipitation with an increase in the EFC temperature to 40°C and holding at this temperature for 3 days, the rate of fluorine precipitation increases by 3% compared to conditions at room temperature, and the rate of precipitation of other substances and elements decreases to 5–10%. It can be seen that the EPA composition is easier to study during the production process directly at room temperature.

Scientific studies show that impurities in EFC thicken them during the evaporation process, which makes the process more difficult. That is why they are being researched. It is known from the literature data that with an increase in the concentration of EFC by evaporation, it thickens and its fluidity decreases. The fact that it interferes with the next step, the process of continuing concentration. And to obtain concentrated mineral fertilizers, it requires them, i.e. sediment separation by some methods.

In the process of enrichment of EFC with evaporation, obtained from Karatau phosphorites with a magnesium content of more than MgO 2%, fluidity practically disappears when its concentration reaches 39-40%. Local, that is, Central Kyzylkum phosphorites contain about 0.55% magnesium. The initial concentration of thickening during evaporation of the resulting EFC corresponds to a concentration of 45-46%. Therefore, they must be evaporated and precipitated when the concentration of EFC reaches 45% in order to obtain a concentrated phosphorus fertilizer. Chemical analysis of the separated precipitate gave the result below in Table 2:

Table 2

CaO	MgO	Al_2O_3	Fe_2O_3	P_2O_5 общ	F	Na	K	Precipitate washed with acetone
20,41	14,20	0,23	4,50	1,72	12,51	1,02	1,22	From reduced to 45 % P_2O_5 EFC after 16 hours
22,74	13,56	0,37	2,37	0,83	9,56	11,23	5,05	From reduced to 45 % P_2O_5 EFC after 26 hours.
26,83	16,91	0,76	2,64	0,72	11,34	4,99	1,03	From reduced to 45 % P_2O_5 EFC after 36 hours
29,71	13,73	1,21	2,61	0,89	11,98	8,01	1,48	From reduced to 45 % P_2O_5 EFC after 50 hours.

As can be seen from Table 2, magnesium, which negatively affects fluidity, i.e. thickens it, is deposited in the largest amount in 36 hours. And calcium CaO drops at a high level at 50 hours.

To study the reliability of the results of the study, calcium CaO and magnesium MgO substances were added to thermal phosphoric acid (TPA), separately and together in an amount corresponding to the table above. It was observed that with the addition of magnesium, the degree of thickening of the mixture significantly reduced fluidity compared to calcium. However, when compared with EFC, it was seen that in TPA the fluidity is higher.With the combined addition of magnesium and calcium substances to TFA, the fluidity was significantly reduced, and precipitation also appeared significantly when the total concentration reached 51% P_2O_5. It can be seen that in the process of concentrating EFC, magnesium and calcium substances in their composition are the main factors in the formation of precipitates.The experiment showed that when calcium and magnesium were added to thermal phosphoric acid at a concentration of 28% P_2O_5 of the amount contained in EFC, and evaporated to concentrate it, magnesium had a greater negative effect on acid fluidity compared to calcium. Therefore, it was considered optimal to obtain a higher concentration of EFC by evaporating the EFC to a concentration of 45%, separating the precipitate after 36 hours, and then continuing the concentration.

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The evaporation of the original EFC to a concentration of 45–46% P_2O_5 and its settling for 16–36 hours allows its further concentration without a sharp deterioration in rheological properties to a concentration of 60% P_2O_5. Chemical and physicochemical analyzes showed that the composition of the initial EFC was complete orthophosphate acid.Our extensive studies of the processes of sulfuric acid processing of the thermal concentrate of phosphorites of the Central Kyzylkum for EFC and its concentration, the study of the physicochemical properties of acids formed during processing and concentration, indicate the practical possibility and expediency of producing high-quality EFC from Kyzylkum phosphorites and its further use to obtain concentrated fertilizers.

On the other hand, due to its composition, the presence of a significant amount of magnesium in the sediment that precipitated during the concentration period makes it possible to use this sediment in the production of solid phosphorus fertilizers. In the context of modern environmental problems, the introduction of the use of waste generated during the concentration of EPA can lead to an increase in crop yields. In this regard, the magnesium contained in the waste is taken into account in the production of fertilizer with a magnesium component. Because it is known from agrochemical data that magnesium is also an essential nutrient for plants.

Another waste is fluorine, the presence of which in the waste can be converted to gaseous waste by acid treatment through a reaction involving phosphogypsum. The main and important reagent used in this case is phosphogypsum, which contains an insoluble silicate-containing precipitate, fluorine combines with silicate, flies out of the system, and passing through the absorbent, air pollution is prevented. This method makes it possible to obtain a fluorine solution, which can serve as a necessary secondary raw material for industry.

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