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DECOMPOSITION OF PHOSPHATE RAW MATERIALS USING MOLYBDENUM CONTAINING SULFUR POTASSIUM SOLUTION

Abstract: *The possibility of decomposition of apatite concentrate with the use of molybdenum-containing sulfur solution and the formation of phosphorus-potassium fertilizers was studied. It is established that the use of molybdenum-containing sulfur solution in the process of decomposition of apatite concentrate reaches a high degree of decomposition, with simultaneous introduction of phosphorus-potassium fertilizer microelement. The main technological parameters of the process and analytical indicators of the finished product are defined. The obtained phosphorus-potassium fertilizers with molybdenum additives have standard physical and chemical properties.*

Key words: *phosphorus-potassium fertilizer, sulfur-potassium solution, molybdenum-containing solution, decomposition, apatite concentrate.*

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Introduction

At the present time in the world scale the consumption of agricultural products in mineral fertilizers is increasing year by year. Therefore, the chemical industry produces different types of mineral fertilizers, and their range is constantly increasing. However, the need for agriculture in mineral fertilizers is not fully met. In addition, in the provision of agricultural crops with mineral fertilizers, a special role is given to fertilizers, which contain not only one, but two and more nutrients. At the same time, a great importance is gained by the introduction of micronutrient fertilizers, which play an important role not only in increasing the productivity of agricultural crops, but also improving their quality.

Analysis of literary data shows that in the provision of agricultural crops with mineral fertilizers plays a special role phosphorus-potassium fertilizers. The production of phosphorus-potassium fertilizers is mainly carried out with the use of sulfate and potassium chloride in the process of decomposition of apatite concentrate [1-4], and phosphorus-potassium fertilizers with the addition of micronutrient supplements. This is due to the fact that the existing methods do not have a wide range of applications in terms of existing raw materials and technological shortcomings [5-8].

Result

As the source component used gray technical acid according to GOST 2184-77, potassium chloride according to GOST 4234-77, apatite concentrate according to GOST 22275-76 and molybdenum containing the solution produced (MOR22-23 electric lamp4 H4). %, HNO318-20%, H2O and other additives-remaining.

The method of the experiment is summarized as follows: in a three-cornered round flask equipped with a bag and a thermometer pour MOR, support on a closed electric stove up to 600C and intensively stirring the mixture. After dissolution of potassium chloride, the resulting molybdenum-containing sulfur solution is cooled to 40-450C and withstand a certain time. In this case, the separated gaseous chlorinated hydrogen is directed under the discharge (200-250 mm Hg) at the absorption node. Then add to the molybdenum-containing sulfuric acid solution of sulfuric acid with a concentration of 63% and the resulting acidic solution is heated or cooled to 700C. Then in this solution during intensive mixing for three minutes pour apatite concentrate, calculated on stoichiometry [10-12] to the total amount of gray acid and mix for another 5 minutes.

The resulting masses withstand temperatures of 110-1150C for 1 hour and receive molybdenum-containing phosphorus-potassium fertilization.

The main technological indicators of molybdenum-containing phosphorus-potassium fertilization are given in Table 1.

Table 1. The main technological parameters of the decomposition of apatite concentrate with the use of molybdenum-containing sulfur solution

Naming of indicators	Unit of measurement	Variation interval	Optimal parameters
MOR			
total concentration	%	62-71	66
quantity	г	112-117	115
temperature	^{0}C	23-32	28
KCl	г	46-60	52
KCl solution			
temperature	^{0}C	66-70	70
temperature	sec	8-24	12
Cooling solution			
Temperature	^{0}C	30-50	45
time	sec	4-10	4

Note: In the numerator of the analysis of fresh superphosphate, in the denominator through the 2nd day

From Table 2 it can be seen that the use of molybdenum-containing sulfur solution in the process of decomposition of apatite concentrate allows the production of phosphorus-potassium fertilizers with the addition of trace elements-molybdenum. At this rate, the concentration of apatite concentrate in the fresh fertilizer is 91.7-96.7%, and in two days 93.1-98.1%. This is achieved by increasing the concentration of hydrogen ions in the reaction mass, as in the dissolution of potassium chloride in the molybdenum-containing solution are formed different compounds of potassium sulfates (KHSO4, K3H (SO4) K2SO4·6KHSO4, K2SO4·H2SO4), which have a positive effect on the decomposition of apatite concentrate.

Some agriculture requires the supply of fertilizers in granulated form with the addition of molybdenum fertilizers to the process of neutralization, drying, classification and refrigeration according to the scheme [13].

Table 2 shows the analytical indicators of granulated phosphorus-potassium fertilizers with the addition of molybdenum.

Table 2. Analytical indicators of granulated phosphorus-potassium fertilizers with molybdenum additives

P_2O_5, %		%			Granulimetric composition, %				Mechanical strength of a granule, MPa
free	assimilable	H_2O	K_2O	Mo	<1	1-4	4-6	>6	
2.2	15.6	3.5	6.2	0.12	1	92	7	0	2.6
2.5	16.4	3.2	6.3	0.11	2	94	4	0	2.9
2.0	16.2	3.3	7.9	0.12	1	94	5	0	2.7
2.1	16.3	3.4	6.6	0.11	3	93	4	1	2.6

1.9	16.4	3.2	6.7	0.13	1	95	4	0	2.7
2.0	17.0	3.0	6.8	0.13	2	96	2	0	3.0
2.2	16.9	3.1	6.7	0.13	1	94	5	0	2.9
2.0	16.7	3.2	6.6	0.121	2	94	4	0	2.7

These data show that the total content of nutrients in the granular fertilizer is 21.8-24.1%, has high mechanical strength, good granulimetric composition and the content of microelements fully comply with the regulatory and technical documents [10]. At the same time, fertilizers contain mes-nutritive elements of calcium and sulfur. The obtained technological and analytical indicators can serve as the basis for industrial testing.

Conclusions

The work carried out makes it possible to use a molybdenum-containing sulfur-potassium solution in the decomposition of apatite concentrate and to obtain a phosphorus-potassium fertilizer with molybdenum additions. At the same time, warehouse ripening of phosphorus fertilizer is excluded, environmental protection is improved due to the disposal of spent molybdenum-containing solution of electric lamp industries. At the same time, the cost of phosphorus-potassium fertilizer with molybdenum additives is reduced. Since together molybdenum salts are used in the spent molybdenum-containing solution and the need for agriculture in fertilizer with additives of the microelement molybdenum is partially satisfied.

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