Production of Complex Fertilizer by Activating Low-Grade Phosphorites. A Review

[1]Kholiyorova Oghiloy J	[1]Master's student, Chemical Technology, Master's Department Termiz Institute of Engineering and Technology,
[2]Mirzakulov CH. X	[2]Doctor of Technical Sciences, Professor, Tashkent Institute of Chemical Technology Director of the Center for Training and Professional of Teaching Staff Technical
[3]Diyarov Kh.D.	[3]Doctor of technical and philosophical sciences (Ph.D), Termiz Institute of Engineering and Technology [1]Gmail: oxolyorova95@gail.com

ABSTRACT

In this scientific work, a studying of conducted on obtaining mineral complex fertilizers using methods of thermal enrichment of low-grade phosphorites. Enrichment of low-grade phosphates Production from non-enriched phosphate raw materials and thermal concentrate has been launched. Technical conditions have been developed for all types of raw materials in Central Kyzylkum. Despite the similarity of Central Kyzylkum phosphorite with phosphorite deposits in other North Africa and Afghanistan, some parts are different. Therefore, the method of production of products obtained from Central Kyzylkum phosphorite differs from the methods of traditional production. Central Kyzylkum phosphorite has some advantages over previously used Karatau phosphorite. It is a deficiency of four oxides of magnesium, iron, aluminum, and silicon.

Keywords: Mineral fertilizers, Central Kyzylkum, phosphorites, thermal enrichment

1. Introduction.

Phosphorites, which mainly contain carbonates and organic additives, are thermally enriched. In order to reduce the ratio of CaO and P2O5, calcined phosphorite contains calcium and magnesium oxides [1].

A number of studies have been devoted to the theoretical study of phosphorite ores [2], the rate of decomposition of only phosphorites in the temperature range of 600-1100C has been studied. In this case, the heating rate is equal to 180 oC. In the literature [3] it is shown that OH-.. F bonds are formed as a result of dehydration of phosphorite ores. It was found that as a result of incineration of phosphate ores, the processes of flotation, coagulation, filtration and improvement of product quality are intensified. As a result, it is possible to obtain water-soluble phosphorus mineral fertilizers from this ore [4,5]. They differ from each other in terms of ore content, burning conditions, phosphorite content. In order to reduce the consumption of acid to obtain K3PO4 and mineral fertilizers from carbonate-bearing ores, ores are burned at 480-13700C, sieved, separated and other methods are used [6]. Several new methods of thermal enrichment have been developed[7]. For beneficiation of phosphorite ores. The ore is crushed to a size of < 2 mm. After that, the phosphate and carbonate phases are separated from each other by the method of thermal enrichment. Depending on the type of mineral, the temperature is 350-750 oC for calcium ores and dolomite ores. 600-800 ° C. The difference in the method is that the ores are crushed in

ball mills, then separated into grades, and the part that does not pass through the sieve goes through repeated stages. Thermal enrichment is carried out in rotary kilns. In this case, pulp and gas are supplied in a direct flow. After cooling, the phosphate is crushed in ball mills and then separated into grades, in which the particle size is <80-120 μm, and the phosphate part is completely separated during the crushing process. In this method, 90% phosphate concentrate is obtained[8]. In this method, carbonate-retaining phosphates are burnt. At the exit from the furnace, it is sharply cooled by air supply. Air carries away most of the mineral. Lime is extracted from it. The remaining part is crushed and returned to the oven[9]. Two-stage combustion has been developed by some researchers[10].

2. Experimmental part

2.1. Obtaining EFK and NRSa fertilizer by processing low-quality phosphorites.

Currently, the most common method of obtaining phosphoric acid is the extraction of phosphorite with sulfuric acid. The process is carried out in two stages. In the first step, a liquid solution of phosphates reacts with a dilute solution of H_3PO_4:

$Ca_5F(PO_4)_3+mH_3PO_4=5Ca(H_2PO_4)_2+(m-7)H_3PO_4+HF$

In the second stage, there is a process of interaction with sulfuric acid.

$Ca(H_2PO_4)_2+H_2SO_4=2H_3PO_4 + CaSO_4$

Calcium sulfate can precipitate in the form of dihydrate, hemihydrate and anhydride. Accordingly, it is divided into dihydrate, hemihydrate and anhydride mode. EFK is obtained in the form of calcium sulfate crystals. It is shown that the rate and mechanism of crystallization depends on the degree of saturation of the solution, the solubility of calcium sulfate in a mixture of acids, the presence of impurities and other factors. By changing the crystallization conditions of $CaSO_4$, dihydrate processes were carried out [83] to obtain concentrated phosphoric acid solutions. The process of obtaining phosphoric acid] is described, which is based on the decomposition of phosphates containing carbonates at high temperatures and with a mixture of acids with phosphate and sulfuric acid, in which the decarbonization process is carried out at 60-700C and in the ratio of H_3PO_4: H_2SO_4 = (4: 5) : 1. will go Due to the following disadvantages of the process, the foaming process is high when the concentration of sulfate chloride is up to 16%, and the separation of the precipitate in the state makes filtering somewhat difficult.

The disadvantage of this method is the extraction of H3PO4, which contains up to 8% insoluble residue, which is not of high quality.In the dihydrate mode, acid containing 20-23% P_2O_5 is obtained, and in the hemihydrate method, 40% P2O5 is obtained.The physicochemical properties of the obtained acid were determined: density, viscosity, electrical conductivity, melting point and heat capacity, heat coefficients and heat dissipation.

The scientific basis of the technology of decomposing unenriched phosphorite and washed concentrate using different standards of sulfuric acid to obtain fertilizers containing nitrogen-phosphorus-calcium from the high carbonate phosphorite of Central Kyzylkum was studied.

3. Results and its discussion

3.1. Preparation of NPCa-mineral fertilizer based on suspension of nitrocalcium phosphate.

The high-carbon phosphorites of Central Kyzylkum, after treatment with concentrated nitric acid, contain 9.69% CaO, 2.94% R2O5, 2.8% N and 70 Nitrocalcium phosphate suspension containing 35% H2O components is obtained.

Phosphorite containing 46.70% CaO, 18.80% P2O5 and 15.19% CO2 components in Central Kyzylkum was obtained using 52.5% nitric acid to obtain nitrogen-phosphorus-calcium mineral fertilizer. The process took place at a temperature of about 500 C. As a result of the experiments, the pH value of the solution changed in the range of 0.5-3.0, and the ratio of nitrocalcium phosphate production (hereafter nkfs) to phosphate raw materials (f / s) is 1: 0.5 to 1: 1

Table-3.1.

Chemical composition of mineral fertilizer obtained as a result of processing nitrate calcium phosphate suspension. t = 500C.

	pH solution	Chemical composition of mineral fertilizer (%)								
		P_2O_5 total	P_2O_5	$\frac{P_2O_5усв}{P_2O_5общ}$ %	P_2O_5	$\frac{P_2O_5усв}{P_2O_5общ}$ %	P_2O_5 water	CaO total	CaO suv.	Azot (N_2
	Calcium nitrate f/s:1:0.5 ratio									
	0,5	13,98	9,37	67,02	7,83	56,01	2,61	37,35	13,85	6,82
	1	14,47	9,15	63,23	7,62	52,69	2,15	38,66	12,35	6,18
	2	14,76	8,60	58,27	7,17	48,58	1,99	39,44	11,09	5,54
	3	15,26	8,42	55,18	7,02	46,00	1,45	40,79	9,78	4,86
	1 : 0,75									
	0,5	15,04	8,66	57,58	7,22	48,01	2,02	38,92	10,72	5,20
	1	15,52	8,39	54,06	6,99	45,04	1,75	40,66	9,58	4,80
	2	16,00	7,38	46,12	6,15	38,44	1,46	41,68	8,55	4,43
	3	16,71	6,49	38,84	5,36	32,08	1,22	43,79	7,48	3,65
	1 : 1									
	0,5	15,72	6,04	38,42	5,03	32,00	1,69	39,98	0,95	4,35
0	1	15,97	5,80	36,32	4,79	29,99	1,45	40,89	7,82	3,92
1	2	16,09	5,31	33,00	4,43	27,53	1,24	41,74	6,99	3,43
2	3	16,76	5,15	30,73	4,29	25,60	1,05	44,44	6,05	3,03

Conclusion

Research on the production of NPCa fertilizers using low-grade phosphorites in the central Kyzylkum region using a suspension of nitric acid and enriched phosphorite is aimed at solving the following tasks.

Studying the process of chemical enrichment of high-carbonate phosphorites of Central Kyzylkum with nitric acid, then washing the acidic products with calcium nitrate and water solution;

determine the effect of phosphate on the chemical composition; standards and concentrations of nitric acid; calcium nitrate wash solution concentration;

References

1. Gropyanov V.M., Ovchinnikova T.T., Soboleva V.A., Kachanova YE.A. Priblijenniy metod rascheta kinetiki dekarbonizatsii fosforitov v neizotermicheskix usloviyax // JPX.- 1977.-50.- №8.-S.-1892-1893.
2. Xolomyanskiy I.YA., Sutsul`kovskiy V.YA., Smirnov YU.M., Knubovets V.G.,
3. Kavitskaya F.A. Vliyanie objiga na svoystva fosforitov // Xim. prom.-1971.-№2.-S.-111-112.
4. Smirnov YU.M. Ratsional`nie sposobi pererabotki fosforitnix rud Karatau // Xim.prom.-1973.-№7.-S.-513-514.
5. Dohum Mohammad M., Tarshan Mohammad M., Elgendy Mohammad M. Roasting of Phosphate Ore in a Fluidized Bed Furnace: Effects of Some Variables // J. Appl.Chem. and Biotechnol.-1978.-28.-№8.-pp.-531-538.
6. Rambabu Ch., Majumdar K.K., Phadnis A.N. Study of the enrichment of phosphate ore containing calcite, Kanpur deposit (Rojastan) // Indian I.Technol.-1973.-11.-№ 2.-pp.-78-82.
7. 7. Bliskovsky V.Z., Mager V.O., Shinkorenko S.F., Mikhailova T.G. On the influence of structural and mineralogical features on the

enrichment of phosphorites of the Central Kyzylkum basin by the roasting method // Vsesoyuzn. meeting “Problems of the use of poor and non-traditional phosphate raw materials for the production of fertilizers”.- Proc. report..-M: -1985.-p.70-71.
8. 8N.N. Treushchenko, B.A. Kopylev, G.V. Belchenko. Interaction of sulfur dioxide with a suspension of phosphorite in an aqueous solution of magnesium bisulfite.// Sat. tr. Leningrad. technologist. inst. im. Lensoveta.- 1973.- issue. 4.- S.- 157-160.
9. Treushchenko N.N., Kopylev B.A., Belchenko G.V., Tkacheva V.A. Interaction of an aqueous suspension of carbonized phosphorite with nitrogen oxides.// Sat. tr. Leningrad. technol. in-t im. Lensoveta.- 1976.- Issue 5.-S.- 142-145.
10. Treushchenko N.N., Kromf R.A., Kopyle B.A. Selective extraction of phosphates and carbonates from phosphate ores of the Kingisep deposit with sulfuric acid // ZhPKh.-1984.-57.-№4.-S.-721-726.
11. Rambabu Ch., Majumdar K.K., Phadnis A.N. The study of the enrichment of phosphate ore containing calcite, the Kanpur (Rojastan) deposit // Indian I.Technol.-1973.-11.-No. 2.-pp.-78-82.