NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 7, ISSUE 4, Apr. -2021

DEVELOPMENT OF TECHNOLOGY FOR PRODUCING NP-FERTILIZER BASED ON LOCAL RAW MATERIALS

Nazirova Rahnamokhon Mukhtarovna
Doctor of Technical Sciences (PhD), Associate Professor of the
Depmrtment “Technology storage and primary processing of Agricultural Products”of the Fergana Polytechnic Institute;

Mirsalimova Saodat Rakhmatzhanovna
PhD in Chemistry, Associate Professor of the
Depmrtment of Chemical Technology of the Fergana Polytechnic Institute;

Makhmudov Asror Mirzajon ogli
Master student of group M7-19;
Fergana Polytechnic Institute

Khamdamova Shohida Sherzodovna
Doctor of Technical Sciences (DSc), Associate Professor of the
Depmrtment of "Chemical Technology" of the Fergana Polytechnic Institute

ANNOTATION:

The article presents the results of nitric and sulfuric acid decomposition of unfortified phosphate rock. In order to determine the degree of decomposition of phosphate raw materials, depending on the concentration and rate of sulfuric acid, the calculated amount of phosphorite was treated with an acid with thorough stirring for 20 min. The resulting product, after cooling and after drying at a temperature of 105-110 °C, was subjected to chemical analysis. Fertilizer production by decomposition of low-grade phosphorites at an incomplete rate of concentrated sulfuric acid and weak nitric acids occurs in a solid-phase mode and differs from classical methods in that when the interaction of the components is completed, the resulting mass is constantly fragmented into small aggregated particles, which, in turn, are continuously enveloped with excess phosphate raw materials.

Keywords: phosphorite, sulfuric acid, superphosphate, degree of decomposition, incomplete rate, acid concentration.

Along with the harvest, there is an intensive removal from the soil of all the nutrients of mineral fertilizers. The deficiency of these elements in soils must be replenished by the application of fertilizers, taking into account the utilization rate of various forms of active substances. However, the utilization rate of fertilizers applied to the soil by plants is still low. Therefore, increasing the efficiency of using mineral fertilizers through the production of higher quality species is an important task. From the above, it follows that it is necessary to create new types of phosphorus and potassium-containing fertilizers and to increase their production. The President of Uzbekistan and the Government of the Republic pay great attention to the issues of building up these industries.

The range of mineral fertilizers produced by the domestic fertilizer industry in terms of the ratio of nutrients does not fully meet the

requirements of agrochemical science for the organization of highly efficient cultivation of agricultural crops. Therefore, an important problem remains the development and implementation of fundamentally new, more economical (unconventional) technologies for processing low-grade local phosphorite ores, including for balance raw materials, into highly effective complex fertilizers with the best technical and economic indicators.

Previous studies on the decomposition of high-carbonate phosphorites of the Central Kyzyl Kum with concentrated sulfuric acid make it possible to develop intensive technologies for obtaining complex phosphorus-containing fertilizers.

The essence of the process of obtaining phosphorus-containing complex fertilizers such as superphosphate is expressed by the reaction of interaction of fluorapatite ($Ca_5(PO_4)$ 3F) - the main component of phosphate raw materials at an incomplete rate with sulfuric and nitric acids.

To determine the optimal conditions for the process of nitric and sulfuric acid decomposition of unfortified phosphate rock, washed phosphoconcentrate and poor phosphorites, sulfuric acid with a concentration of 75, 80 and 93 % and nitric acid with a concentration of 57 – 59 % were used. The rate of sulfuric and nitric acids was calculated for the decomposition of phosphate and carbonate minerals of phosphorite to form monocalcium phosphate, calcium sulfate, and calcium nitrate.

In order to determine the degree of decomposition of phosphate raw materials, depending on the concentration and rate of sulfuric acid, the calculated amount of phosphorite was treated with an acid with thorough stirring for 20 min. The resulting product, after cooling and after drying at a temperature of 105-110 °C, was subjected to chemical analysis. The results are shown in Tables 1-4.

Fertilizer production by decomposition of low-grade phosphorites at an incomplete rate of concentrated sulfuric acid and weak nitric acids occurs in a solid-phase mode and differs from classical methods in that when the interaction of the components is completed, the resulting mass is constantly fragmented into small aggregated particles, which, in turn, are continuously enveloped with excess phosphate raw materials.

Table 1. Influence of the norm of sulfuric (H_2SO_4-93 %) and nitric (HNO_3-59 %) acids on the degree of decomposition of unfortified phosphate rock

Acid rate,%		P_2O_5, %		CaO, %	N, %	K_p, %	H_2O, %
H_2SO_4	HNO_3	general.	digestible				
Before drying							
60	20	11,19	9,76	25,11	1,95	87,22	6,40
50	30	10,20	8,98	22,98	2,60	88,04	8,40
40	40	9,88	8,73	22,17	3,46	88,36	10,81
30	50	9,43	8,36	21,17	4,11	88,65	12,79
20	60	8,93	7,95	20,03	4,70	89,03	14,71
After drying							
60	20	11,78	10,38	26,43	2,05	88,12	1,47
50	30	10,79	9,69	24,61	2,80	88,33	1,51
40	40	10,89	9,60	24,36	3,80	88,40	1,99
30	50	10,60	9,38	23,79	4,65	88,49	2,21
20	60	10,26	9,10	23,02	5,40	88,69	1,97

Table 2 Influence of the norm of sulfuric (H_2SO_4-80 %) and nitric (HNO_3-59 %) acids on the degree of decomposition of unfortified phosphate rock

Acid rate,%		P_2O_5, %		CaO, %	N, %	K_p, %	H_2O, %
H_2SO_4	HNO_3	general.	digestible				
Before drying							
60	20	10,94	9,52	24,50	1,91	87,02	7,01
50	30	10,16	9,89	22,79	2,67	88,19	9,37
40	40	9,85	8,46	21,49	3,36	88,31	14,52
30	50	9,20	8,16	20,64	4,03	88,70	17,92
20	60	8,81	7,83	19,76	4,63	88,88	18,52
After drying							
60	20	11,52	10,06	25,79	2,01	87,33	1,06
50	30	10,92	9,64	24,51	2,87	88,28	1,47
40	40	10,53	9,32	23,62	3,63	88,51	1,67
30	50	10,22	9,08	22,93	4,48	88,85	2,13
20	60	10,13	9,01	22,71	5,32	88,94	1,75
60	20	11,24	9,89	25,25	1,97	87,99	2,01
50	30	10,63	9,40	28,89	2,79	88,43	1,27
40	40	10,64	9,43	23,89	3,74	88,63	1,78
30	50	10,34	9,16	23,22	4,54	88,59	1,83
20	60	10,08	8,94	22,66	5,31	88,69	1,67

The results of the chemical analysis of the obtained complex fertilizer show that with an increase in the norm of nitric acid from 20% to 60%, the nitrogen content increases from 1.97% to 5.31% and the water-soluble form of CaO from 3.94% to 10.62% in the form of four aqueous calcium nitrate.

Complex fertilizer before drying, obtained by decomposition of unenriched phosphate flour with a mixture of acids at their ratio H2SO4: HNO3 = 60: 20 and 50:30, has satisfactory commercial properties. Further increase in the rate of nitric acid leads to a smearing mass.

It was found that the use of sulfuric acid with a concentration of 75 and 80% leads to an increase in the moisture content in the composition of the complex fertilizer.

The main components of a complex fertilizer obtained by nitric-sulfuric acid decomposition of unfortified phosphate rock are mono and dicalcium phosphate, calcium sulfate and nitrate.

Table 3 Influence of the norm of sulfuric (H2SO4-93%) and nitric (HNO3-57%) acids on the degree of decomposition of poor phosphorites

Acid rate,%		P_2O_5, %		CaO, %	N, %	H_2O, %	CO_2, %	K_p, %
H_2SO_4	HNO_3	general.	digestible					
Before drying								
60	20	10,20	8,95	26,74	2,14	8,19	1,78	87,74
50	30	10,10	8,81	26,26	3,16	9,34	1,67	87,00
40	40	9,65	8,49	25,05	4,03	12,32	1,50	87,98
30	50	9,26	8,17	24,08	4,81	15,53	0,83	88,23
20	60	9,94	8,82	25,80	6,22	20,75	0,90	88,73
After drying								
60	20	11,08	9,84	28,35	2,31	1,40	1,80	88,80
50	30	11,10	9,76	28,79	3,43	1,40	1,69	87,93
40	40	10,83	9,55	28,12	4,52	1,44	1,58	88,18
30	50	10,77	9,57	27,96	5,62	1,71	0,95	88,85
20	60	12,16	10,81	31,56	7,62	2,31	0,97	88,90

Table 4. Influence of the norm of sulfuric (H_2SO_4-75 %) and nitric (HNO_3-57 %) acids on the degree of decomposition of washed fosconcentrate

Acid rate,%		P_2O_5, %		CaO, %	N, %	H_2O, %	CO_2, %	K_p, %
H_2SO_4	HNO_3	general.	digestible					
Before drying								
60	20	10,31	9,06	20,32	0,97	5,52	1,28	87,87
50	30	9,72	8,56	19,16	1,31	7,80	1,14	88,06
40	40	9,19	8,10	18,20	1,65	9,84	1,02	88,14
30	50	8,72	7,71	17,20	1,96	11,67	0,9	88,42
20	60	8,31	7,36	16,39	2,24	13,36	0,81	88,57
After drying								
60	20	10,74	9,45	21,17	0,98	1,58	1,33	87,99
50	30	10,34	9,12	20,38	1,40	1,91	1,21	88,20
40	40	10,00	8,85	19,70	1,80	2,00	1,11	88,50
30	50	9,69	8,60	19,10	2,18	1,86	1,01	88,75
20	60	9,44	8,39	18,63	2,55	1,55	0,91	88,88

The decomposition of washed phosphoconcentrate and poor phosphorites by a mixture of nitric and sulfuric acids practically does not differ from that of unfortified phosphate rock.

It was found that with an increase in the rate of sulfuric acid, the content of calcium sulfate increases, and with an increase in the rate of nitric acid, a highly hygroscopic calcium nitrate in the composition of a complex fertilizer.

The interaction of unfortified phosphate rock with a mixture of sulfuric and nitric acids proceeds very easily and is practically completed in 5-7 minutes. The process is exothermic, the temperature, depending on the rate of sulfuric acid, rises to 35-80 ° C.

The main components of a complex fertilizer obtained by nitric-sulfuric acid decomposition of various types of phosphate raw materials are four aqueous calcium nitrate, two aqueous calcium sulfate, calcium phosphates, and activated phosphorite. The content of calcium nitrate increases with an increase in the norm of nitric acid.

The commercial properties of nitrogen-phosphorus complex fertilizers have been studied.

On the basis of the results obtained, a schematic diagram was developed for obtaining a complex nitrogen-phosphorus fertilizer by intensive decomposition of high-carbonate phosphorites with a mixture of nitric and sulfuric acids.

REFERENCES:

1. Р.Назирова, С.Таджиев, С.Мирсалимова, Ш.Хамдамова. //Интенсификация процесса получения сложных удобрений из местного сырья//.Монография. отв. ред. Б.С.Закиров. – Уфа: Omega science, 2019, 126 с. https://www.elibrary.ru/item.asp?id=41588683
2. М.Собиров, Р.Назирова, Ш.Хамдамова, С. Таджиев.//Интенсификация процесса получения комплексных суспендированных удобрений с инсектицидной активностью//. Монография. Фергана-Винница: ОО «Европейская научная платформа», 2020. 137 с. https://doi.org/10.36074/tad-

sob-naz-ham.monograph

3. Икрамов, М., Назирова, Р., Мирсалимова, С., & Таджиев, С. //Новые виды суспендированных удобрений на основе местного сырья//. Монография. Фергана-Винница: ОО «Европейская научная платформа», 2020. 123 с. https://doi.org/10.36074/ik-na-mi-ta.monograph
4. Roziqova D.A., Sobirov M.M., Nazirova R.M., Hamdamova Sh.Sh. //Production of nitrogen-phosphorus-potassum fertilizers based on washed hot concentrate, ammonium nitrate and potassum chloride//. Academicia an international multidisciplionary research journal. 2020. vol 10.issue 9, September, page 215-220.https://www.indianjournals.com/ijor.aspx?target=ijor:aca&volume=10&issue=9&article=029
5. Назирова Р.М., Мирзаолимов А.Н., Таджиев С.М., Мирсалимова С.Р. //Разработка технологии азотно-серного жидкого удобрения на основе местного сырья// Universum: технические науки: научный журнал. – № 8(77). Часть 3. М., Изд. «МЦНО», 2020. – стр 33-38. https://cyberleninka.ru/article/n/razrabotka-tehnologii-azotno-sernogo-zhidkogo-udobreniya-na-osnove-mestnogo-syrya
6. Назирова Р.М., Таджиев С.М., Мирсалимова С.Р., Кодирова М.Р //Сложные удобрения на основе азотнокислотной переработки необогащённой фосфоритной муки в присутствии нитрата аммония//. Universum: технические науки: научный журнал. – № 6(75). Часть 3. М., Изд. «МЦНО», 2020. – стр 18-22. https://cyberleninka.ru/article/n/slozhnye-udobreniya-na-osnove-azotnokislotnoy-pererabotki-neobogaschyonnoy-fosforitnoy-muki-v-prisutstvii-nitrata-ammoniya
7. Nazirova R.M., Khoshimov A.A., Tadjiyev S.M., Mirsalimova S.R. //Investigation of solubility kinetics and interaction of stabilizing additive in production of complex fertilizers based on granular nitrate and stabilizing additives//. Academicia an international multidisciplionary research journal. 2020. vol 10.issue 5,may page 657-664. https://www.indianjournals.com/ijor.aspx?target=ijor:aca&volume=10&issue=5&article=091
8. Назирова Р.М., Таджиев С.М., Хошимов А.А., Мирсалимова С.Р. //Изучение физико-химических свойств добавок при производстве новых видов сложных стабилизированных удобрений//. Universum: технические науки: научный журнал. – № 5(74). Часть 2. М., Изд. «МЦНО», 2020. – стр 69-73. https://cyberleninka.ru/article/n/izucheniе-fiziko-himicheskih-svoystv-dobavok-pri-proizvodstve-novyh-vidov-slozhnyh-stabilizirovannyh-udobreniy
9. Назирова Р.М, Таджиев С.М., Мирсалимова С.Р., Хошимов А.А. //Сложные удобрения на основе азотно-сернокислотной переработки необогащенной фосмуки, нитрата аммония и карбамида//. “Проблемы современной науки и образования” научно-методический журнал. Издательство «Проблемы науки». Москва, 2020. № 5 (150). стр 20-25. https://cyberleninka.ru/article/n/slozhnye-udobreniya-na-osnove-azotno-sernokislotnoy-pererabotki-neobogaschennoy-fosmuki-nitrata-ammoniya-i-karbamida
10. Назирова Р.М., Таджиев С.М., Мирсалимова С.Р., Хамдамова З.

//Интенсификация процесса получения комплексных удобрений на основе местного сырья//. Научно-методический журнал ”Наука, техника и образование” - 2019-№ 9 (62) с.8-12. https://cyberleninka.ru/article/n/intensifikatsiya-protsessa-polucheniya-kompleksnyh-udobreniy-na-osnove-mestnogo-syrya

11. Назирова Р.М, Таджиев С.М., Мирсалимова С.Р., Худаярова Д. //Интенсивная технология получения NPK-удобрений на основе мытого сушёного концентрата Центральных Кызылкумов//. Научно-методический журнал ”Проблемы современной науки и образования ” -2019.-№2(135), с.6 https://cyberleninka.ru/article/n/intensivnaya-tehnologiya-npk-udobreniy-na-osnove-mytogo-sushyonogo-kontsentrata-tsentralnyh-kyzylkumov
12. Назирова Р.М., Таджиев С.М., Мирсалимова С.Р., Каримов Д.Д. //Комплексные удобрения на основе местного сырья//. Научно-методический журнал “Проблемы науки”. 2019. №11(47), с. 25-28. https://cyberleninka.ru/article/n/kompleksnye-udobreniya-na-osnove-mestnogo-syrya
13. Abdurakhmonova N.K., Nazirova R.M., Mirsalimova S.R.//Phosphoric-potash fertilizers based on sulfuric acid Processing of phosphorite flour and potassium Chloride//. Academicia an international multidisciplionary research journal. 2020. vol 10.issue 10, october, page 252-255. https://www.indianjournals.com/ijor.aspx?target=ijor:aca&volume=10&issue=10&article=036
14. Назирова Р.М., Таджиев С.М., Мирсалимова С.Р., Маруфжанов А. //Фосфорно-калийные удобрения на основе камерного суперфосфата// Международный электронный научно-практический журнал «Современные научные исследования и разработки» Изд. «ОЛИМП», 2028. – стр 614-617. https://www.elibrary.ru/item.asp?id=37033732
15. Назирова Р.М, Таджиев С.М., Закиров Б.С., Тўхтаев С.С. //Получение NPK-удобрения из мытого сушеного фосфоритового концентрата// UNIVERSUM:Технические науки: электрон. науч. журн. 2016. №10(31). https://cyberleninka.ru/article/n/poluchenie-npk-udobreniya-iz-mytogo-sushenogo-fosforitovogo-kontsentrata