



GETTING COMPLEX FERTILIZERS ON THE BASIS OF CENTRAL KIZILKUM POWDER PHOSPHORITES

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Annotation: This article presents the results of research on the production of complex fertilizers based on the neutralization of samples of Central Kyzylkum waste phosphorite in ammonia solution of the decomposed product at incomplete levels of nitric acid. This includes the study of complex mineral fertilizers containing PN by decomposing phosphorite samples at different rates (40-90) and neutralizing the resulting slurry with ammonia solution in the atmosphere of pH with the range 5.5-8.5. All forms of P_2O_5 and CaO (total, plant-soluble and water-soluble) and total nitrogen content, which were the main constituents of the samples obtained, were analyzed.

Keywords: Phosphorite, nitric acid, ammonia, fertilizers, phosphorus, nitrogen, calcium.

МАРКАЗИЙ ҚИЗИЛҚУМ ЧАНГ ФОСФОРИТИ АСОСИДА МУРАККАБ ЎҒИТЛАР ОЛИШ

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Аннотация: Ушбу мақолада Марказий Қизилқум чиқинди фосфорит намуналарини нитрат кислотанинг тўлиқсиз меъёрларида парчалаб олинган маҳсулот аммиак эритмасида нейтраллаш асосида олинган мураккаб ўғитлар олиш тадқиқотлари ўтказиш натижаси кўрсатилган. Бунда фосфорит намуналарини турли меъёрда (40-90) парчалаб, ҳосил булган бўтқани рН муҳитини 5,5-8,5 оралиғида аммиак эритмаси билан нейтраллаб таркибида PN сақлаган мураккаб минераль ўғитлар олиш тадқиқоти келтирилган. Олинган намуналарнинг асосий таркибий қисми бўлган P_2O_5 ва CaO ларнинг барча шакллари (умумий, ўсимлик ўзлашувчан ва сувда эрувчан) ва умумий азот миқдорлари таҳлил қилинди.

Калит сўзлар: Фосфорит, нитрат кислота, аммиак, ўғитлар, фосфор, азот, кальций.

ПОЛУЧЕНИЕ КОМПЛЕКСНЫХ УДОБРЕНИЙ НА ОСНОВЕ ПЫЛЕВИДНЫХ ФРАКЦИЙ ФОСФОРИТОВ ЦЕНТРАЛЬНЫХ КЫЗЫЛКУМОВ

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Аннотация: В статье представлены результаты исследований по производству комплексных удобрений на основе нейтрализации проб фосфоритов отходов Центральных Кызылкумов в аммиачном растворе продукта разложения при неполном содержании азотной кислоты. Сюда входит изучение комплексных минеральных удобрений, содержащих ПН, путем разложения образцов фосфоритов с разной скоростью (40-90) и нейтрализации полученного шлама раствором аммиака в



атмосфере с рН в диапазоне 5,5-8,5. Были проанализированы все формы P_2O_5 и CaO (общие, растворимые в растениях и водорастворимые) и общее содержание азота, которые были основными составляющими полученных образцов.

Ключевые слова: фосфорит, азотная кислота, аммиак, удобрения, фосфор, азот, кальций.

The main prospects for the development of agriculture in the world are the introduction of new technologies of soil cultivation, the creation of high-yielding varieties of crops and, of course, to increase productivity through the use of quality mineral fertilizers. In this regard, attention is being paid to further improving the physicochemical and consumer properties of mineral fertilizers, which are one of the main factors in the production of high-yielding and quality crops.

Globally, there has been an increase in the consumption of phosphorus fertilizers used to improve the phosphorus nutrition of soils and plants. This is because phosphorus fertilizers increase the quality and size of crop yields, accelerate the growth of plants and increase their resistance to adverse climatic conditions. Therefore, it is important to increase the production of phosphorus and complex phosphorus fertilizers and expand their range.

Theoretical and practical results are being achieved in our country on the basis of comprehensive measures to organize a number of scientific studies on the development of technologies for the production of complex fertilizers based on local raw materials and the implementation of cost-effective methods of their application in agriculture. In this regard, special emphasis should be placed on ammophos, nitrophos, superphosphate, ammonium nitrate and other fertilizers that increase crop yields. However, not enough attention has been paid to the fact that these fertilizers are not satisfactory in terms of content in order to obtain high yields from plants and high energy is consumed to produce them. The third direction of the Strategy of Actions on Further Development of the Republic of Uzbekistan identifies important tasks aimed at "consistent development of agricultural production, further strengthening food security, expanding the production of environmentally friendly products, significantly increasing the export potential of the agricultural sector." In this regard, an important task is to create a rational technology for the production of new varieties of high-quality complex fertilizers based on high-carbonate Central Kyzylkum phosphorites.

At present, special attention is paid to the development of new technologies and research in the chemical industry, including the production of mineral fertilizers, aimed at the full use of each country's own raw material resources. The efforts of scientists and specialists in this field are aimed at finding solutions to these scientific and technical problems, which are very important today. For this, product manufacturing methods using cheap, affordable and as much chemical and mining waste as possible are widely used. In the research work on the extraction and processing of phosphorite ores and in the new technologies being developed, special attention is paid to obtaining effective and high-quality mineral fertilizers from relatively low-quality phosphorites.

The Kyzylkum Phosphorite Complex provides phosphate fertilizer plants in Uzbekistan with phosphate raw materials and it produces a washed-burnt concentrate containing an average of 26% P_2O_5 per year. 186,000 tons of P_2O_5 is produced from this amount of phosphate raw materials in the form of mineral fertilizers. However, the volume of mined phosphorite ore is 1874.6 thousand tons or 320.93 thousand tons of P_2O_5 . This means that in the existing system of thermal enrichment, a large loss of P_2O_5 (42% of the total ore volume) occurs as phosphorite waste. These phosphorite wastes are mineralized masses, sludge and powder phosphorites. At present, the agricultural demand for phosphorus fertilizers in the country is only 23%. In the absence of phosphorus fertilizers, the involvement of these phosphorite wastes in agricultural needs is an urgent problem.



In order to solve this problem, experimental work was carried out to obtain a PN-containing fertilizer based on phosphorite waste powdered phosphorite and nitric acid. The composition of all primary raw materials was studied before carrying out the experimental work. Then the stoichiometric norms of nitric acid for the decomposition of phosphorite samples were calculated in the amount of 40-90%, relative to the calcium oxide content of the raw material. The pH of the resulting slurry was neutralized in the range of 4.5–8.5.

The experiments were performed under laboratory conditions in thermostatic glass reactors equipped with a mixer. A pre-measured phosphorite sample is added to the reactor, followed by the gradual addition of a specified amount of nitric acid. The temperature during the decomposition of phosphorite varies in the range of 40–55 ° C, depending on the acid norm, and lasts for 25 minutes. At the end of the disintegration time, the slurry was neutralized with an ammonia solution. All forms of P₂O₅ and CaO (total, plant-soluble and water-soluble) and total nitrogen content, which were the main constituents of the samples obtained, were analyzed [1-3].

The results obtained are presented in Table 1.

The processing of phosphorite in nitric acid proceeds by the following reactions [4].

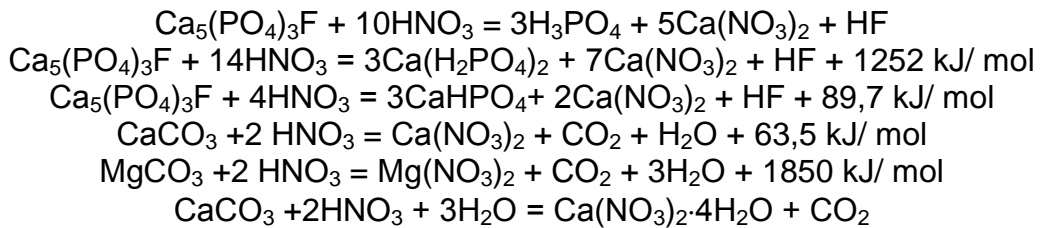


Table 1.

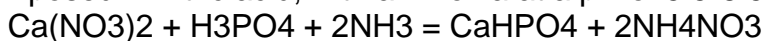
Chemical composition of fertilizers based on powdered phosphorite,%

HNO ₃ norm, %	N	P ₂ O ₅			CaO		
		P ₂ O ₅ total	P ₂ O ₅ ass./P ₂ O ₅ total*100	P ₂ O ₅ soluble in water/P ₂ O ₅ total*100	CaO total	CaO ass./CaO total*100	CaO soluble in water /CaO total*100
40	6,46	12,81	36,25	1,25	32,33	43,62	19,35
50	7,61	12,06	45,62	3,24	30,45	50,32	25,44
60	8,63	11,40	52,32	5,44	28,79	57,36	31,77
70	9,55	10,81	60,24	7,36	27,29	65,74	37,48
80	10,38	10,28	68,47	8,46	25,94	73,74	44,57
90	11,12	9,79	75,32	9,14	24,72	81,45	51,24

The results of chemical analysis of the composition of the formed fertilizers show that the decomposition rates of powdered phosphophytes vary depending on the acid norm. For example, the total amount of P₂O₅ in the nitrogen-phosphorus complex fertilizer decomposed phosphorite under the influence of various stoichiometric norms of nitric acid is 12.81–9.79%, the plant assimilation form is 31.25–70.32%. In addition, it contains 6.46–11.12% nitrogen and 32.33–24.72% calcium oxide.

The commodity properties of the product are reduced due to the strong hygroscopic calcium nitrate in the fertilizer, which decomposes phosphorite samples at high rates of nitric acid. Calcium nitrate in it increases the hygroscopicity of the fertilizer. [5-6].

Therefore, samples were obtained by neutralizing a slurry of phosphorite, which was decomposed in nitric acid, with ammonia at a pH of 5.5-8.5.



The results showed that with increasing pH, the nitrogen content of the samples increased, the commodity properties improved, and the total, plant-soluble and water-soluble forms of P₂O₅ decreased to a relatively small extent. In conclusion, the study of



complex mineral fertilizers containing PN, in which the Central Kyzylkum waste phosphorite is decomposed in nitric acid in different proportions and neutralized the resulting slurry with ammonia solution was done. The results obtained show that the

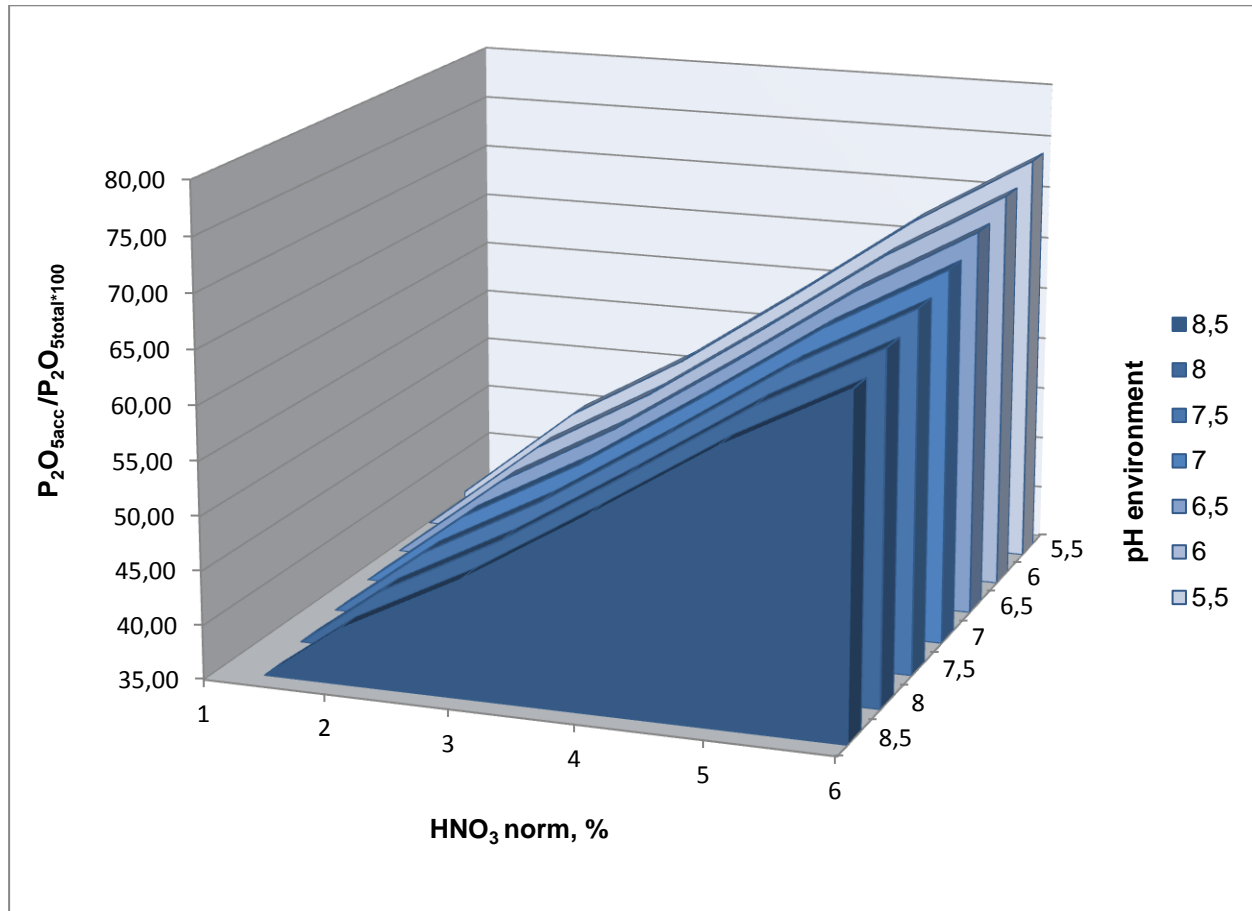


Figure 1. Plant-assimilated form of P₂O₅ in fertilizers based on powdered phosphorite

decomposition rates of powdered phosphorite depend on the acid norm, the pH environment, which means the absorption amounts of phosphorus five oxides increase with the norm increase, and as the pH of the medium increases, the total nitrogen content increases.

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