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CONCENTRATED PHOSPHORUS-CONTAINING FERTILIZERS BASED ON LOCAL RAW MATERIALS

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ABSTARCT:

The article presents the results of research on the development of new types of phosphorus-containing fertilizers based on local raw materials. The resource-saving technology of obtaining concentrated superphosphate from high-carbonate raw materials of the Central Kyzyl Kum is shown. The main advantages of this technology are: the absence of units for diluting concentrated sulfuric acid, storage maturation of acidic superphosphate, ammonization, drying and granulation. The analysis of the obtained phosphorus fertilizers, obtained by the developed technology, showed that they are low hygroscopic, have a high moisture capacity, and their physical properties begin to deteriorate sharply only at a moisture content of about 20 %.

KEYWORDS: phosphorites, chamber and flow methods, sulfuric acid, highly carbonated phosphorites, recycle, hopper, batcher, model installation.

INTRODUCTION:

Together 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. But the utilization rate of the fertilizers applied to the soil by plants is still low. Therefore, increasing the efficiency of using mineral fertilizers through the production of better quality species is an important task. From the above, it follows that there is a need to create new types of phosphorus-containing fertilizers and 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 phosphorites of the Central Kyzylkum deposits are of great importance for the Republic of Uzbekistan. The total reserves of granular phosphorites are estimated at 10 billion tons of ore. The most promising and studied areas are the Dzheroyskaya and Sardarinskaya areas, the probable reserves for which to a depth of 100 m are more than 100 million tons. P_2O_5. In recent years, the scale of

implementation of the processing of natural phosphates into complex fertilizers in Uzbekistan has increased significantly. A wide variety of chemical technological schemes have been created, an in-depth study of individual stages of the processes is being carried out, the sources of phosphate raw materials are being expanded to obtain highly concentrated phosphorus fertilizers. In the future, in order to provide the national economy with phosphate raw materials, it will be necessary to bring into operation almost all of the currently known deposits on the territory of the Republic of Uzbekistan.

By varying the technological parameters of the process, it is possible to obtain phosphorus-containing fertilizers with an adjustable ratio of nutrient components, which predetermines their high agrochemical efficiency and the possibility of using them on any soils and for any agricultural crops.

On the basis of these data, for the first time in the world practice, the employees of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan have developed a high-intensity and resource-saving technology for obtaining granular superphosphate from highly carbonized Kyzylkum phosphorites. The main essence of the technology is the treatment of phosphorites with a high carbonate content with highly concentrated sulfuric acid. The process of decomposition, drying and granulation takes place in one apparatus - auger-mixer-granulator for 15-20 minutes. The main advantages of the developed technology in comparison with the current chamber technology are: the absence of units for diluting concentrated sulfuric acid, storage maturation of acid superphosphate, ammonization, drying and granulation. The main advantage of the developed technology in comparison with the chamber technology currently used at the Kokand superphosphate plant is the elimination of energy-intensive and lengthy stages: dilution of concentrated acid, chamber decomposition (1.5-2 hours), warehouse ripening (4-6 days), ammonization and drying, carried out in rotating drums, as well as the classification of the finished product and others. Due to a significant simplification of technology, intensification of the process and savings in heat and power costs, the prime cost of simple superphosphate is reduced by 25-30 %. The chemical composition of the product does not differ from the chamber superphosphate, however, in terms of its commercial properties, it significantly surpasses it.

The results of agrochemical and microbiological tests of simple superphosphate carried out at the Uzbek Research Institute of Cotton Growing of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan, the State Research Institute of Soil Science and Agrochemistry of the State Committee for Agriculture of the Republic of Uzbekistan, the trophology laboratory of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan indicate that that it has a beneficial effect on the growth, development and yield of cotton. Its performance is equivalent to the Kokand superphosphate.

In order to test the technology for obtaining a single phosphate fertilizer, we have created a model installation based on the results of the research carried out in the scientific research technological laboratory of the Institute of General Education and Science The main units of the installation for obtaining concentrated phosphorus fertilizer are mixing of the initial components (phosphorite, EPA and recycle) and additional decomposition of phosphorite. The supply of phosphate raw materials and recycle is carried out through the hopper of the auger batcher (1), made of St. 3. A screw mixer (3), which was made of stainless steel X18H10T, is provided for mixing EPA,

phosphorite and retur. The resulting acidic product from the screw mixer enters the additional decomposer (drum-type apparatus). The additional breaker (4) is made of plain steel. It is a drum 1 m long, inside the drum blades were welded to mix the product. The required temperature for additional decomposition in the additional decomposer is created by supplying hot air coming from the heater. The decomposition machine rotates at a speed of 2-3 rpm. Using an electric motor.

Experiments on obtaining concentrated phosphorus fertilizer on a model setup were carried out for a month. The work used ordinary phosphorite flour produced by the Kyzylkum phosphorite plant, composition (wt.%): 17.20 P_2O_5; 46.22 CaO; 16.00 CO_2; 1.24 Al_2O_3; 1.05 Fe_2O_3; 1.75 MgO; 2.0 F and one stripped off extraction phosphoric acid to a P2O5 concentration of 29.86%. The mass ratio of P_2O_5 EPA: P_2O_5 FS varied from 1: 0.3 to 1: 0.8. The experiments were carried out periodically. Phosphorite and phosphoric acid were fed into the screw mixer simultaneously. The amount of supplied phosphorite and EPA was adjusted, respectively, by changing the rotational speed of the metering screw (1) and a Mariotte flask (5). For each period of time, phosphorite and phosphoric acid were supplied to the screw mixer strictly according to the given ratio P_2O_5 EFA: P_2O_5 F / C. And the amount of the supplied retur did not exceed 30-40% of the volume of the finished product. After 12-15 minutes, a decarbonated phosphate mass came out of the screw. The process of complete decarbonization and additional decomposition of phosphate flour was carried out in an additional decomposer at a temperature of 100-105 ° C. In this apparatus, the process was completed in 20-25 minutes. In the case of obtaining a wet product, it was dried in an additional decomposer. The dried products were sieved by hand. For each ratio P_2O_5 ЭФК: P_2O_5 Ф / С a separate batch of fertilizer was obtained. Dried samples of phosphorus fertilizers were analyzed for the content of various forms of phosphorus, calcium and CO_2. The results of the analysis are summarized in Table 1.

Table 1. Chemical composition of concentrated phosphorus fertilizers obtained on a model plant.

Mass ratio P_2O_5 EPA: P_2O_5 PRM	Humidity pulp after decomposition, %	The chemical composition of the dried product, %							$\frac{P_2O_5}{\text{digestibility}}$ P_2O_5 general in 2% lim. acid %	$\frac{P_2O_5}{\text{digestibility}}$ P_2O_5 general 0.2 M tril. B %	$\frac{P_2O_5}{\text{water}}$ P_2O_5 general %	$\frac{CaO}{\text{digestibility}}$ CaO general %	$\frac{CaO}{\text{water}}$ CaO general %
		P_2O_5 general	P_2O_5 digestibility in 2 % lim. acid	P_2O_5 digestibility 0.2 M tril. B	$\frac{P_2O_5}{\text{water}}$	CaO general	CaO digestibility in 2 % lim. acid	$\frac{CaO}{\text{water}}$					
1:0,3	26,09	2,76	41,34	37,61	30,47	25,85	24,86	18,60	10,15	90,98	73,71	62,53	74,82
1:0,4	23,95	3,02	37,91	31,66	25,35	20,32	28,12	18,26	9,04	83,52	66,87	53,60	64,94
1:0,5	21,63	3,39	36,47	28,81	22,83	14,31	32,67	19,97	6,02	79,0	62,60	39,24	61,13
1:0,6	20,84	3,82	34,99	26,31	21,21	6,60	35,26	20,15	2,81	75,20	60,62	18,87	57,15
1:0,7	19,00	4,25	33,14	23,90	18,78	3,39	36,67	20,53	1,57	72,12	56,67	10,23	55,99
1:0,8	18,19	5,02	32,0	22,30	17,37	2,21	37,96	19,44	1,11	69,69	54,29	6,91	51,52

The data in the table confirm the closeness of the content of nutrient components of the samples of phosphorus fertilizers

obtained in laboratory conditions and on a model installation.

To carry out agrochemical tests, we obtained pilot batches of phosphorus fertilizers at a ratio of P_2O_5 EFK: P_2O_5 F / C 1: 0.5.

Based on the data of laboratory experiments and experiments on a model installation, the main indicators of the technological process for obtaining a concentrated one-sided phosphorus fertilizer have been developed.

The physicochemical properties of single phosphoric fertilizers obtained under optimal conditions of activation of ordinary phosphorite flour with phosphoric acid and its mixture with sulfuric acid have been determined.

The results of the experiments showed that single phosphoric fertilizers obtained under optimal conditions by activating ordinary phosphorite flour of the Central Kyzyl Kum with phosphoric acid and its mixture with sulfuric acid are low hygroscopic, have a high moisture capacity, and their physical properties begin to deteriorate sharply only at a moisture content of about 20 % ...

According to the developed technology, pilot plants for the production of superphosphate were built at Samarkandkimyo and Electrokhimzavod factory.

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