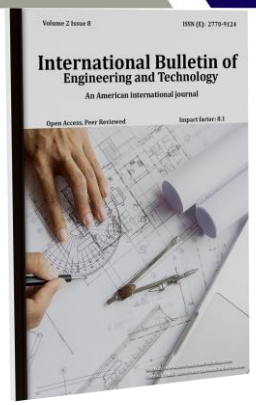

TECHNOLOGY FOR OBTAINING CALCIUM AND MAGNESIUM PHOSPHATE FERTILIZERS USING LOCAL CARBONATED RAW MATERIALS

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Abstract: One of the main chief factors in the rapid development of Agriculture is, first of all, chemization, which is associated with the comprehensive and effective use of fertilizers, through which it will be possible to achieve an average increase in the yield of agricultural plants by 40-50%. Costs for the production and application of fertilizers are covered 2-3 times at the expense of additional agricultural products produced [1].

Keywords: magnesium carbonate, calcium carbonate, carbonic acid, phosphoric acid, phosphorus oxides, extraction.

Phosphorus fertilizers produced all over the world are obtained on the basis of apatite and other types of phosphate concentrates. According to data from the International Association for fertilizer production (IFA) from 2012 to 2019, phosphorus fertilizers increased from 42,706 to 46,648 million tons with a score of 100% R2O5. This indicates that in the natura state, the demand for phosphorus fertilizers increased by an average of 1 million tons per year. But as a result of the declining production of rich phosphate raw materials, there is a tendency to cover poor low-grade, in particular, carbonated raw materials, which account for two-thirds of the world's reserves of phosphates [2].

As phosphorus fertilizers in the Agriculture of our republic, ammophos, obtained mainly from phosphorites of Central Kyzylkum, as well as ordinary superphosphate, are used. As you know, ammophos does not contain calcium. As a result of prolonged regular use of ammophos, the mobile calcium and magnesium contained in the soil decrease from year to year. This leads to a deficiency of calcium and magnesium in plant and living organisms. As a result of the lack of mobile calcium and magnesium in the soil, the structure of the soil deteriorates, the yield of plants decreases, various diseases are caused by a decrease in immunity in living organisms [3].

On the territory of our republic, industrial production is made up of calcium and magnesium carbonates that meet technological requirements: calcite, limestone, dolomite and other local non-ferrous mineral raw materials are found in large quantities. The state balance of the Republic includes 24 limestone and dolomized limestone deposits (as well as 4 other types of carbonate raw materials), the reserve of which is 1017.8 million tons, only 294 thousand tons of limestone are used to obtain Lime by industry categories. In addition, large quantities of waste containing calcium and magnesium carbonates are formed in water treatment plants (enterprises for the production of nitrogen fertilizers, Turakurgan TPP), and their complex processing has not been established. An important role is played by the comprehensive study of calcium and magnesium carbonate raw materials and waste from a

technological point of view, as well as the establishment of their use in the production of quality products on an industrial scale – calcium (as well as magnesium) phosphate fertilizers, which are easily assimilated by plants [4-5].

In practice, concentrated phosphorus fertilizers are produced based on the neutralization of extractive phosphoric acid (EFK) obtained from phosphorites. It uses ammonia gas (in the production of ammophos), phosphorites (in the production of fertilizers of the double superphosphate type) as a neutralizing agent [6-29]. In order to reduce the consumption of expensive raw materials – washed burnt phosphoconcentrate per unit of product (compared to double superphosphate), reduce the consumption of ammonia raw materials and increase the volume of products (in relation to ammophos), the process of processing efk from the Central Kyzylkum washed burnt phosphoconcentrate into simple phosphoric fertilizers containing calcium and magnesium phosphates was studied by reducing the consumption. When carbonate waste is applied, a large volume of stable foam is formed in the neutralization reactor. This reduces reactor productivity. For this reason, it was recommended to neutralize efk with burnt (at a temperature of 700OC) carbonate waste. As a result, there is an acceleration of the neutralization process.

In the process of neutralizing efk, in the composition, weight % account: CaO=44.83, MgO=1.58, CO2=36.50, R2O3=0.74, SO3=0.84 and insoluble residue (e.q.) The waste of the water treatment plant ("Fergana-nitrogen" JSC) with=0.37 – calcium and magnesium carbonates were used.

Initially, the waste of the water treatment plant was thermally treated. It was found that when the waste is burned for 60-180 minutes at a temperature interval of 100÷1050oc, the mass loss reaches from 12.31% to 51.64%. When heated for 1 hour at a temperature range of 100÷200oC, mass loss is observed at 14.11% (at the expense of moisture and crystallization water), and at a temperature range of 200÷400oc, another mass loss of 0.54% (at the expense of decomposition of R(OH)3) [30]. It was found that in the temperature range of 500÷800oc, mass loss was from 15.14% to 20.36% (mainly due to the breakdown of MgCO3·CaCO3), while in the temperature range of 850÷1050oc, mass loss was from 30.77% to 51.64% (mainly due to the breakdown of CaCO3). The technological parameter of thermal treatment of waste water treatment plant – calcium and magnesium carbonates and the chemical composition of the generated combustion products are presented in Table 1.

The processes of neutralization of efk with calcium and magnesium carbonate waste of the water treatment plant and its combustion products (in the temperature range of 100÷1050oc) and the stable foaming processes that are formed in it were studied. To do this, in the composition, in the weight % account: R2O5 = 17,23, CaO = 0,32, MgO = 0,66, Fe2O3 = 0,30, Al2O3 = 0,41, F= 1,18, etc., the composition was taken from the burning of the Enterprise JSC "Fergana-nitrogen", which was indicated above, and in the composition, in the weight % account: CaO = 53,55, MgO = 1,89, R2O3 = a burning product was used, which was 0.88, CO2 = 42.24, SO3 = 1.00, etc.

Table 1
Dependence of the chemical composition of the waste on the combustion temperature

№	Burning	burning time	Minute mass	Олинган маҳсулот кимёвий таркиби, %						
				CaO	MgO	R_2O_3	SO_3	CO_2	H_2O	э.қ.

	temperature, ^{0}C		loss, %							
				44,83	1,58	0,74	0,84	36,5	15,14	0,37
1.	100	60	12,31	51,12	1,80	0,84	0,96	41,62	3,23	0,42
2.	200	60	14,11	52,19	1,84	0,86	0,98	42,50	1,20	0,43
3.	300	60	14,49	52,43	1,85	0,87	0,98	42,69	0,76	0,43
4.	400	60	14,65	52,52	1,85	0,87	0,98	42,77	0,57	0,43
5.	500	60	15,14	52,83	1,86	0,87	0,99	43,01	-	0,44
6.	600	60	15,39	52,98	1,87	0,87	0,99	42,84	-	0,44
7.	700	60	16,28	53,55	1,89	0,88	1,00	42,24	-	0,44
8.	800	60	20,36	56,29	1,98	0,93	1,05	39,28	-	0,46
9.	850	60	25,49	60,17	2,12	0,99	1,13	35,10	-	0,50
10.	900	60	30,77	64,76	2,28	1,07	1,21	30,15	-	0,53
11.	950	60	41,63	76,80	2,71	1,27	1,44	17,15	-	0,63
12.	1000	60	50,51	90,58	3,19	1,50	1,70	2,28	-	0,75
13.	1000	120	51,55	92,53	3,26	1,53	1,73	0,19	-	0,76
14.	1000	180	51,64	92,70	3,27	1,53	1,74	-	-	0,77
15.	1050	60	51,64	92,70	3,27	1,53	1,74	-	-	0,77

Ammonium nitrate was added to the efk in an amount of 1% compared to its mass. The added ammonium nitrate serves to improve the solubility of calcium and magnesium phosphates in suspensions that are formed during the neutralization process. The acid norm in the process of neutralizing efk with a concentration of 17.23% R2O5 with calcium and magnesium carbonate waste and its combustion product was 100% compared to the stoichiometric amount corresponding to the formation of monocalcityfosphate, monomagnyphosphate, iron and aluminum phosphates. The neutralization process took 30-

40 minutes at room temperature. The formed suspensions were dried at a temperature range of 95÷100os.

When ammonium nitrate is added to solutions of phosphate-acid salts, the water solubility of the salts in the solution improves. For this reason, ammonium nitrate is added to the starter efk, and by neutralizing it with carbonated raw materials, obtaining concentrated phosphorus fertilizers containing calcium and magnesium in an easily assimilated form is achieved.

When comparing the production of calcium and magnesium phosphate fertilizers, which are easily assimilated by neutralizing extractive phosphoric acid with carbonated raw materials (chalk, limestone, dolomite, waste from a water treatment plant) and thermally treated products, evaporating suspension, drying and grading them, the possibility of completely reducing the consumption of ammonia raw materials and increasing the total volume of products by 4-5% is created. In this method of producing phosphorus Fertilizers, a reduction in the consumption of expensive raw materials – phosphorite thermoconcentrate by 15-20% compared to the method of producing double superphosphate is achieved.

The proposed technology is 23.3 billion a year when applied to a phosphorus fertilizer production enterprise with a capacity of 136,000 t R2O5. it is determined that the economic effect will be achieved.

In the process of phosphate acid extraction, it will be possible to obtain high-quality environmentally effective concentrated phosphorus fertilizers with calcium and magnesium phosphates in the composition by cleaning efk from fluorine and sulfates with local carbonated raw materials, extracting purified acid by filtration and neutralizing it with chalk, dolomite or limestone raw materials in the second stage.

The created new technology "Kokand superphosphate plant" was tested in an experimental test device adapted to industrial conditions in AJ, an experimental sample of granulated calcium and magnesium phosphate fertilizer was obtained. Fertilizer with calcium and magnesium phosphate obtained in the conditions of industrial production was tested in the laboratory of agrochemistry of the Institute of general and inorganic chemistry of the FA of the Republic of Uzbekistan and found that the fertilizer has a high agrochemical effect [30-32].

In the process of phosphate acid extraction, it is possible to obtain high-quality environmentally effective phosphoric concentrated fertilizers with calcium and magnesium phosphates in the composition, as well as high-grade ammophos from low-quality phosphating raw materials by neutralizing purified efk with ammonia gas, by cleaning efk from fluorine and sulfates with local carbonated raw materials, and by neutralizing it with chalk, dolomite or limestone raw This ensures a high economic effect in the production process.

Thus, by neutralizing efk with calcium and magnesium carbonate raw materials, as well as its combustion product, it is achieved to accelerate the neutralization process by 2.5-3 times by using calcium and magnesium carbonate waste of a water treatment plant in obtaining phosphorus fertilizers containing monocalciphosphate and monomagnyphosphate. The quality of the resulting product is improved. Compared to the current methods of production of fertilizers of double superphosphate type from phosphorites, valuable phosphorite raw materials are saved by 15-20%, and when compared to the production of ammophos, ammonia raw materials are fully saved and the possibility of increasing the volume of products by 4-5% is created.

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