STUDY OF NITRIC ACID DECOMPOSITION PROCESSES OF TECHNOGENOUS WASTE

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Abstract. *The article presents the processes of processing man-made waste of the Central Kyzylkum phosphorite production plant with nitric acid and the possibilities of producing fertilizers based on them.*

Аннотация. *В статье представлены процессы переработки техногенных отходов Центрально-Кызылкумского фосфоритового завода азотной кислотой и возможности производства удобрений на их основе.*

Keywords. *nitric acid, nitrogen-phosphoric acid porridge, mineralized mass, man-made waste.*

Калит сўзлар. *азотная кислота, азотно-фосфорная каша, минерализованная масса, техногенные отходы.*

Introduction. Based on local raw materials, a number of scientific researches are being carried out on the creation and development of complex fertilizers containing nitrogen, phosphorus, potassium and other nutrients. In particular, in the production of phosphorous fertilizers, there are many scientific and practical achievements, as well as shortcomings. The main raw material for the production of phosphorus fertilizers in our country is Central Kyzylkum phosphorites.

A number of man-made wastes are released during the production of phosphorite flour at the Kyzylkum plant, causing great damage to the environment, and the demand for phosphate raw materials requires the inclusion of these wastes in production processes. One of the most urgent problems today is the development of technologies for obtaining simple and complex fertilizers necessary for agriculture, involving the production of man-made waste. Processes of obtaining liquid and (or) granular fertilizers based on the processing of man-made waste (mineralized mass) formed during the enrichment of Central Kyzylkum phosphorites were studied in order to attract man-made waste to production. At first, the processes of decomposition of mineralized mass in different concentrations of nitric acid were studied.

Research object and methods.

Under laboratory conditions, the experiments were carried out in a laboratory apparatus consisting of a tubular glass reactor equipped with an electric motor-driven screw stirrer. In order to carry out laboratory work, man-made waste (mineralized mass composition: P_2O_5 – 12.91%; CaO – 42.88%; CO_2 – 12.84%;) produced at the Central Kyzylkum Phosphorite Combine was treated with incomplete standards of 57% nitric acid for 25 -Degraded for 30 minutes

Calculation of the amount of nitric acid was based on the breakdown of phosphate, free calcium oxide and calcite minerals in the mineralized mass sample, and the formation of monocalcium phosphate and calcium nitrate salts. The acid ratio was 30, 40, 50, 60, 70, 80, 90 and 100% relative to stoichiometry. The temperature was 65-85^oC depending on the acid standard. The composition of the obtained nitrogen-phosphoric acid porridge samples was chemically analyzed

Determination of different forms of phosphorus in samples of raw materials and fertilizers used in scientific research was carried out by differential photometric method [1-5]. The method is based on the formation of a phosphorus vanadium molybdenum complex with a yellow color and photometric measurement of the optical density of this complex at a wavelength of λ = 440 nm compared to a reference solution containing a certain amount of R2O5. Total phosphates were extracted with nitric acid, soluble phosphates were extracted with citric acid and Trilon-B solution, and water-soluble phosphates were extracted with water.

The total amount of nitrogen in the samples was determined using the methods presented in the literature [6-10]. This method is based on the reduction of the nitrate form of nitrogen to ammoniacal nitrogen with the help of Devard's alloy, and the subsequent expulsion of ammonia and its titrometric determination.

Calcium and magnesium in raw materials and samples were determined by the complexonometric method [11-15]. It is based on the change in the color of the indicator as a result of the interaction of calcium and magnesium ions with the trilon-B solution.

Table1

Chemical composition of nitric acid decomposition product of man-made waste, nitrogen-phosphoric acid porridge, %

N			P_2O_5			CaO			CO_2	H_2O
common	amm.	nitre.	common	appro.	wat. mel.	common	appro.	wat. mel.		
when the rate of nitric acid is 30%										
4,38	1,04	3,34	10,19	3,46	-	33,84	9,41	6,68	7,09	10,61
when the rate of nitric acid is 40%										
5,36	1,21	4,15	9,50	4,27	-	31,54	11,67	8,30	5,67	13,43
when the rate of nitric acid is 50%										
6,22	1,36	4,86	8,89	4,98	-	29,54	13,65	9,72	4,42	15,9
when the rate of nitric acid is 60%										
7,03	1,55	5,48	8,36	5,60	-	27,77	15,38	10,97	3,33	18,06
when the rate of nitric acid is 70%										
7,75	1,71	6,04	7,89	6,15	-	26,2	16,92	12,07	2,35	19,99
when the rate of nitric acid is 80%										
8,46	1,91	6,55	7,49	6,51	0,07	24,87	18,23	13,12	1,49	21,76
when the rate of nitric acid is 90%										
9,05	2,08	6,97	7,09	6,80	0,11	23,55	22,60	13,99	0,71	23,25
when the rate of nitric acid is 100%										
9,61	2,24	7,37	6,75	6,7 4	1,42	22,41	22,18	15,30	0,05	24,64

Research results and discussion. The dependence of the chemical composition of the obtained nitrogen-phosphoric acid porridge on the acid standard was chemically analyzed (table).

The results of the analysis showed that when the norm of nitric acid is 30%, the total amount of nitrogen is 4.38%, phosphorus is 10.19%, and calcium is 33.84%. The amount of water-soluble calcium is 6.68%, i.e. 19.74% of total calcium. When the acid level is 40-100% of the standards, the water-soluble form of calcium increases to 26.31-68.27%, respectively. It can be seen that the increase in water-soluble calcium in these samples is associated with an increase in calcium nitrate in the sample. The conclusion is that when the acid level increases, the amount of calcium nitrate in the sample also increases. Depending on the acid ratio (when the acid ratio is 30-100), the amount of water in the nitrogen-phosphoric acid porridge, which decomposed the mineralized mass in different standards of nitric acid, is from 10.61% to 24.64%. Also, its decarbonization rate reaches 99.90%.

Conclusion. So, it was found that it is possible to decompose the mineralized mass with nitric acid and extract the calcium nitrate formed in it by filtering, to obtain high-quality phosphoconcentrate and liquid fertilizers from man-made waste (mineralized mass) and nitrogen-calcium (calcium nitrate) fertilizers.

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