Date: 19th November-2024

STUDY OF THE PROCESS OF DECOMPOSITION OF CENTRAL RED OIL WASHED AND CALCULATED PHOSPHORUS CONCENTRATE WITH NITRIC AND SULFURIC ACIDS

Dady Yassir
Tashkent Institute of Chemical Technology
dady.yassir.23@outlook.com
Zikirov Husan
Assistant Professor, Department of Chemical Engineering, Termez State University of Engineering and Agrotechnology
zikirovhusan1989@gmail.com
Yorbobayev Ruslan
Senior lecturer at Tashkent Institute of Chemical Technology
ruslanyorbobayev@gmail.com

To date, Uzbekistan has achieved a number of scientific and practical results in developing a technology for obtaining nitrogen-phosphorus-potassium fertilizers by acidic and thermal treatment of Central Kyzylkum phosphorites.

The Resolution of the President of the Republic of Uzbekistan; dated 03.04.2019 No. PQ-4265 “On measures to further reform the chemical industry and increase its investment attractiveness” stipulates the modernization and expansion of existing capacities for the production of nitrogen, phosphorus, potassium and complex mineral fertilizers, including these products, at the chemical plants of the Republic, as well as the construction of new energy-efficient capacities;

According to the Ministry of Agriculture, in 2023 the republic will need 1 million 100 thousand tons of fertilizers. There is a demand for 700 thousand tons of phosphorus and 300-350 thousand tons of potassium fertilizers.

Currently, meeting the demand for nitrogen-phosphorus-potassium fertilizers is a very urgent task.

In this scientific research work, scientific research was conducted to study the effects of temperature, time, Liquid:Solid on the filtration process in order to separate the solid-liquid fraction of the washed-burnt phosphorus concentrate (WBPhC) of the CK in the presence of nitric acid and sulfuric acid, and obtain nitrogen-phosphorus and nitrogen-phosphorus-potassium fertilizers from the liquid fraction.

The process of decomposition of the Central Kyzylkum WBPhC in the presence of nitric-sulfuric acids was carried out at 100% standards of a mixture of nitric-sulfuric acids based on the following chemical reaction equations.

$$2Ca_3F(PO_4)_3+14HNO_3+H_2O=7Ca(NO_3)_2+4H_2O+3Ca(H_2PO_4)_2+H_2O+HF+H_2O$$

$$Ca_5(PO_4)_3F+5H_2SO_4+5nH_2O=3H_3PO_4+5CaSO_4\cdot nH_2O+HF$$

International Conferences
Open Access | Scientific Online | Conference Proceedings
INTERNATIONAL CONFERENCES OF PRACTICE

International Conferences
Open Access | Scientific Online | Conference Proceedings
INTERNATIONAL CONFERENCES OF PRACTICE

The process of disintegration and filtration of Central Kyzylkum WBPhC under the influence of different ratios of 56% HNO_3 and 96% H_2SO_4 acids, based on the chemical stoichiometric standard, at a rate of 100% nitric-sulfuric acids, at acid ratios (HNO_3:H_2SO_4) of 50:50, 40:60 and 30:70, at a temperature of 60°C for 40 and 80 minutes in a laboratory experimental model device was studied.

In this scientific research work, the disintegration process was carried out at a solid:liquid (S:L) ratio of 1:4 and the effect of the ratio of nitric and sulfuric acids and the duration of the process on the filtration rate was studied. The results obtained based on the results of the research are presented in the diagram below.

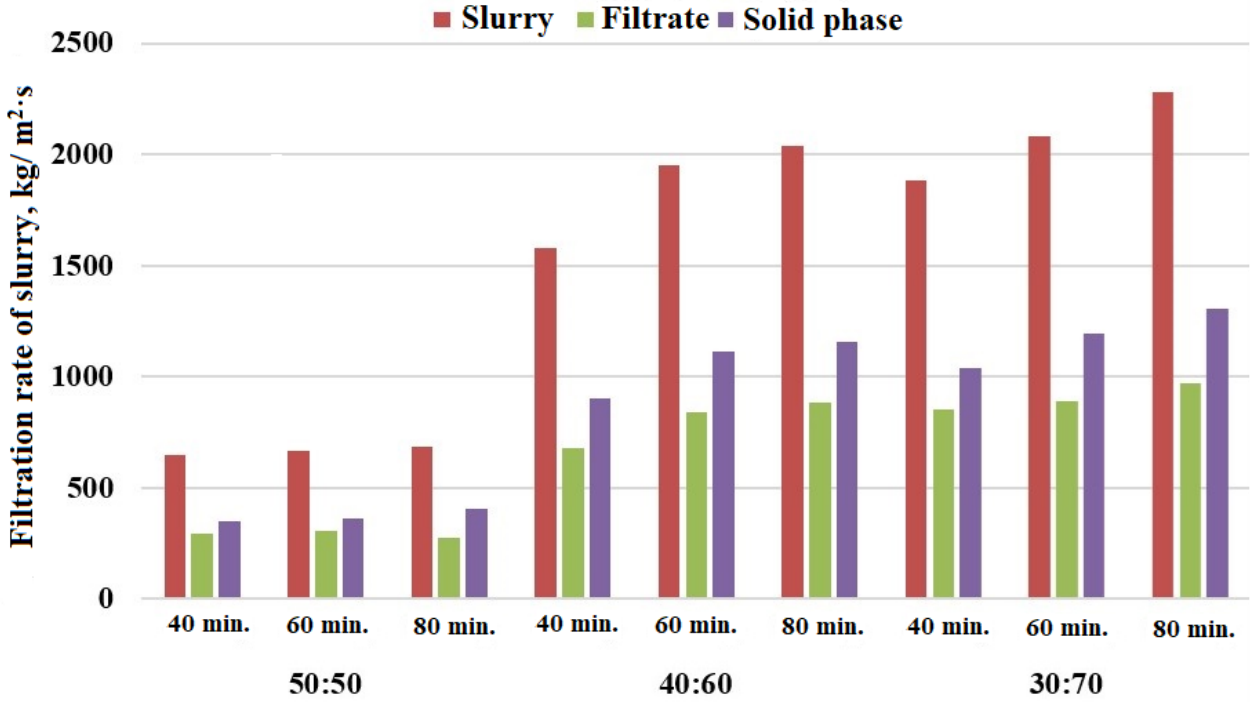

Fig. Filtration rate of slurry from the Central Kyzylkum washed and calcined phosphorus concentrate digested in the presence of nitric and sulfuric acids

From the data presented, it can be seen that the filtration rate increases with the increase in the ratio of HNO_3:H_2SO_4 acids from 50:50 to 30:70 and the increase in the duration of the process. When the HNO_3:H_2SO_4 acid ratio is 50:50 and the process duration is increased from 40 to 80 minutes, the filtration rate on the slurry increases from 646.73 kg/m^2·s to 683.45 kg/m^2·s (from 295.52 kg/m^2·s to 276.37 kg/m^2·s on the filtrate and from 351.21 kg/m^2·s to 407.08 kg/m^2·s on the solid phase), and when the HNO_3:H_2SO_4 acid ratio is 30:70, the filtration rate on the slurry increases from 1886.13 kg/m^2·s to 2279.18 kg/m^2·s (from 850.17 kg/m^2·s to 973.59 kg/m^2·s on the solid phase). It was observed that the filtration rate increased with an increase in the quantitative proportion of sulfuric acid in the ratio of HNO_3:H_2SO_4 acids.

This was explained by the formation of needle-shaped crystals of phosphogypsum that are well filtered with an increase in the proportion of sulfuric acid.

International Conferences
Open Access | Scientific Online | Conference Proceedings
INTERNATIONAL CONFERENCES OF PRACTICE

REFERENCES:

1. Zikirov H.A., Mirzakulov Kh.Ch., Xujamberdiev Sh.M. Researching of the Processes of Obtaining NP and NPK Fertilizers by Processing Phosphorite of Central Kyzylkum With the Participation of Sulfuric and Nitric Acids. I International Journal of Advanced Research in Science, Engineering and Technology Vol. 11, Issue 12, December 2024. SSN: 2350-0328. 41-45 p.

2. Nurmurodov T.I., Erkaev A.U., Kucharov B.Kh. Development of technology on the hydrochloric-, nitric- and sulfuric acid processing of low-grade phosphorites Central Kyzylkum. // Chemical technology. Control and management. Tashkent. 2018. №1-2 (79-80). pp. 65-70.