EFFECT OF EXTRACTION PHOSPHORIC ACID EVAPORATION HEAT ON POLYMERIZATION

Nuriddin Sadriddinovich Bakhriddinov
Namangan engineering and Construction Institute
Associate professor of the Department of labor protection and ecology,
candidate of technical sciences,

Annotation: The article shows the formation of polyphosphates in concentrated acid obtained by evaporation of up to 55% of extraction phosphoric acid from local phosphorene's of the Central Kyzyl Kum, as well as changes in the composition of this acid, its purification from impurities based on chemical, physicochemical analyzes.

Key words: phosphorite, thermocontcentrate, extractive phosphoric acid(EFK), concentrated acid, polyphosphate, chemical analysis, physico-chemical analysis, EFK composition, acid purification, deposition.

INTRODUCTION

At the present stage of economic and social development, the problem of providing the population with the necessary food and agricultural products is in the main place. The way to solve this problem is only through the efficient use of crop fields in agriculture and increasing productivity. Therefore, these issues are included in the main plan of our state.

The problem of fertilizers is in the first place in the development of Agriculture. Because, firstly, there is no lack of organic fertilizers, which are considered basic, and secondly, to replace it, it is necessary to introduce effective methods of producing mineral fertilizers.

In our country, the mineral fertilizer production industry is widely developed. However, it is necessary to increase the degree of assimilation by the plant, the use of raw materials on the basis of austerity in use, the constant continuation of scientific work for the quality of fertilizer.

Currently, attention is paid to the phosphorus, nitrogen and potassium types of mineral fertilizer. The reason for this is that nitrogen fertilizer serves to grow the plant body, potassium fertilizer strengthens the plant body, and phosphorus fertilizer increases productivity. In addition to these, scientific work is being carried out to create wide opportunities for the production of fertilizers containing microelements such as copper, zinc, as well as fertilizers containing potassium, nitrogen and phosphorus.

The production of phosphorus fertilizer is mainly using local homashyo – Central Kyzylkum phosphorites[1]. The amount of phosphorus in this phosphorite is 16-21% P_2O_5 the presence of which requires the use of additional enrichment methods for the production of mineral fertilizers. The use of acidic, mechanical and thermal methods of

SSN (Print): 2204-0595
ISSN (Online): 2203-1731

enrichment leads to an increase in their cost. Taking into account this, it will be necessary to use even a sparing method of enrichment.

Another property of Mineral fertilizers is that the degree of assimilation by the plant is very low after the introduction into the ground, when irrigation is carried out. In particular, the level of use of nitrogen fertilizers on the basis of easy evaporation of nitrogen and easy solubility in water, the evaporation of nitrogen from their contents, the rate at which phosphorous fertilizer is added to the leaching waters and perob waters of the phosphor is high. In order to eliminate these shortcomings, it is necessary to use phased land types of fertilizer, that is, Types in the form of polyphores.

To form phosphorus in the form of a polyforma in the composition of a phosphorous fertilizer, the concentration is increased through the process of evaporation of extractive phosphoric acid (EFK), intended for mineral fertilizer. As is known, it is convenient to use thermal phosphoric acid (tfk), when high concentrations of phosphoric acid appear to be easily assimilated in mineral fertilizers. However, since the cost of this is at a high level, such tfk is not produced in Uzbekistan and is used instead of EFK.

In order to obtain quality ammonium phosphates from EFCS, it is necessary to carry out the process of cleaning them from heavy metal, mishyak, kaltsiy, magnesium and fluorine. This is required to be done in cost-effective ways. Such methods are divided into types of evaporation, deposition, use of organic solvents, ion exchange, crystallization[2]. One of the convenient methods that are currently being implemented is steaming, in which the first efk is carried out to reduce the amount of water contained in it.

In order to increase the amount of phosphorus pentaoxide contained in phosphorus fertilizer, it is required to vaporize the initial extraction phosphoric acid(EFK)obtained from phosphorites[3]. Chemical and physico-chemical analysis showed that the composition of the initial EFG was a complete orthophosphate acid[4,5,6].

Research methods and object

Laboratory work was carried out with the addition of sulfuric acid to phosphorite little by little, in a laboratory device with a simple glass reactor, a water-cooled, electrodvigator mixer against water evaporation as a result of the reaction. Thermal concentrate of Central Kyzylkum phosphorite for laboratory transfer (composition: P_2O_5 – 25,68%; CaO – 53,28%; CO_2 – 2,68%; MgO – 1,22%; F – 2,76, R_2O_3 – 3,58%; SO_3 – 5,01%) and 93% Lee received sulfuric acid. The stexiometric norm of sulfuric acid was determined 100% according to the amount required for the decomposition of calcium in phosphorite and the gel was taken into the aqueous solution of the corresponding concentration.

Sulfuric acid obtained for reaction - H_2SO_4 - $Ca_5F(PO_4)_3$ when reacting with it, the following process is observed:

SSN (Print): 2204-0595
ISSN (Online): 2203-1731

$$Ca_5F(PO_4)_3 + 5H_2SO_4 = 3H_3PO_4 + 5CaSO_4 + HF$$

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As is known, in addition to the main phosphoric acid, which is formed in the process of decomposition of phosphoric acid kaltsium digidro-and gidrophosphates are formed:

$$2Ca_5F(PO_4)_3 + 7H_2SO_4 = 3Ca(H_2PO_4)_2 + 7CaSO_4 + 2HF$$

,

$$2Ca_5F(PO_4)_3 + 4H_2SO_4 = 6CaHPO_4 + 4CaSO_4 + 2HF$$

.The process lasted up to 4 hours and the EFK was separated by filtration method. Repeated this process 3 times, the chemical composition of the EFS obtained was determined by the method of analysis in the established order:

Chemical composition of EFK from phosphorite

1-table

№	P_2O_5	H_2SO_4	CaO	MgO	Al_2O_3	Fe_2O_3	F
Each EFK obtained separately							
1	27,64	0,18	0,51	1,24	1,92	1,45	2,23
2	27,53	0,23	0,53	1,19	1,99	1,38	2,28
3	27,87	0,26	0,48	1,17	1,91	1,42	2,25
Mixed with efks							
4	27,67	0,24	0,51	1,2	1,94	1,42	2,26

It is known that in the process of obtaining a double superphosphate or ammonium phosphate, This obtained EFCS is used. If, proceeding from the current modern demand, the abundance of additional substances and elements contained in it, especially more than the norm of the ftor, negatively affects the quality of the obtained fertilizer. It should be noted that the process of concentrating efk is conducted at a high temperature, which gives a positive result.

With the increase in its concentration in the process of evaporation of efk, the boiling temperature also increases accordingly. EFK concentration 45 % P_2O_5 when to reaches, the boiling temperature 120 ^oC, 50 % and 140 ^oC and 55 % 160 ^oC to reaches (graph 1).

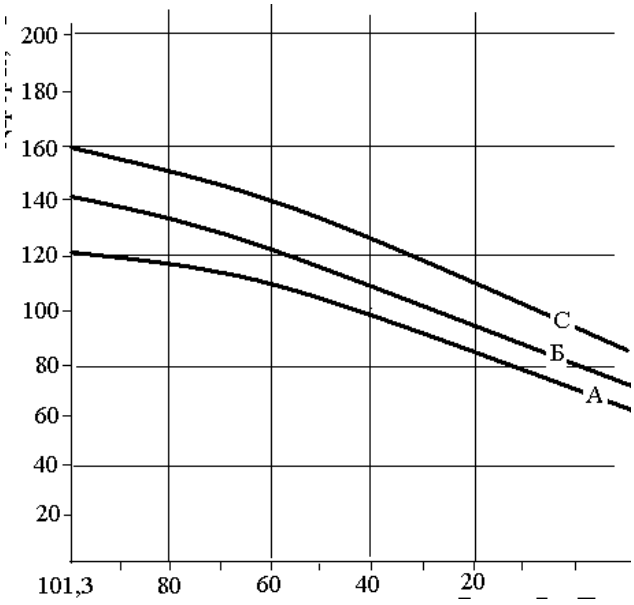

Figure 1: changes in boiling temperature during vacuum vaporization of efk: a-45, B - 50, S - 55% for P2O5 concentration results.

Modern industrial production requires the use of energy-efficient technologies. Accordingly, as can be seen from the picture 1-, boiling temperatures are reduced under

SSN (Print): 2204-0595
ISSN (Online): 2203-1731

conditions when the pressure decreases, and energy savings are observed.

It is known that the presence of the substance and elements contained in the EFK and its amount depends on the composition of the phosphorite used. Fluorine, magnesium and similar additives contained in phosphorite go into the composition of EFK during the extraction process. One of the properties of magnesium is its thickening when the concentration of the evaporated EFK reaches 40%. Therefore, the first stage of the evaporation process is up to 40%, after reaching this concentration, the EFK is cleaned from the deposition of magnesium.

The process of vaporization was carried out in two ways to concentrate the efk – under normal conditions and in a vacuum. When carrying out evaporation under normal conditions, that is, when R0=101,3 kPa, with an increase in the content of EFK P2O5 from 45% to 55%, its boiling temperatures are from 120oS to 160oS, when the pressure is lowered to 20 kPa, respectively, it is possible to see a change in the range from 85oS to 110 os(Figure 1). This, in turn, indicates that the vacuum process allows you to save energy, which is spent on evaporation. The experiment showed that the amount of volatile substances contained in the EFK should be the same as in normal conditions, based on the correspondence of saturated vapor changes in the state corresponding to the concentration. If we see this in the example of fluorine, it can be seen that the amount of fluorine decreases on average by 27,67% as a result of evaporation up to 2,26%, while the content of fluorine in the EFK is 55% P2O5. This can be explained as follows:

- under normal conditions 0,46%;
- 0.47 % in vacuum conditions.

In the process of evaporation, the fluorine fly out of the EFC compound is seen from the result of chemical analysis. The flying output of the ftor in the amount of 1,5-2% compared to the total amount of EFCS can also have a negative impact on the environment. Therefore, it is better to swallow the flying fluoride into an ordinary water absorber.

The second aspect of the changes that are generated in the process of steaming up to 55% of the EFCS obtained for the experiment is the transition of phosphoric acid from orthoform to polyphormic. It basically begins with the fact that the concentration of EFK reaches 40%. The concentrated acids obtained on the basis of the experiment were confirmed by the results obtained in the chromatographic method of Physico-Chemical Analysis [7,8,9], when the concentration reached 40%, the phosphates contained in it were transferred to the polyforming(Table 2).

2-table:

Change in the amount of polyphosphates contained in the process of evaporation of EFK by thermal method to 55% of its concentration

EFK concentration, %	40	45	50	55
The amount of polyphosphate contained in EFK, %	3-4	10-15	25-30	30-40

SSN (Print): 2204-0595
ISSN (Online): 2203-1731

the possibility of using phosphoric acid obtained by dropping up to 55% of the mTOR in the content of concentrated acid to 0,5% . So, as a result of the increase in temperature, the content of the acid in the vaporized K_2SiF_6, $KNaSiF_6$, MgF_2, K_3SiF_6 its appearance is accelerated by falling into the sediment and flying out of the system. On the basis of infrared – IR and radiographic analysis, the deposition content of the sediment separated from 40% EFCS was studied, the concentrations of the acid were determined by chemical and physical chemical analysis methods[10,11,12,13]. Therefore, measures are taken to collect the EFS for the purpose of processing the sediment obtained during the evaporation process and to capture the flying fluorine with the help of absorbers in order to be taken to pollute the ambient air.

The amount of concentrated 55% L EFK content in the above-considered mTOR can be found to be acceptable for the obtained concentrated EFK, which should be from 0,5 to 1%, and there will be opportunities to use these acids not as mineral fertilizers, but for the purpose of obtaining feed fodder for livestock.

The chemical composition of Central Kyzylkum phosphorites may differ in the amount of substances and elements contained in it, depending on the place of its mineral standing. For example, 0,52% of the amount of magnesium contained in it does not reach 1% of the magnesium contained in it when taking EFK from this phosphorite, the first stage of the process of vaporizing such an efk should be achieved in 45% P_2O_5 allows to increase the concentration. Also the same magnesium-containing EFK vaporization temperatures are different.

In conclusion, we can say that the boiling temperature varies depending on the amount of magnesium contained in the EFK. Example, MgO 0,54% when there are 110oS, while 1,50 when there are 154 degrees. The main reason for the fact that evaporation can be continued until the initial stage of the evaporation process is 0,54%, when the amount of magnesium contained in the evaporated EFK is 45%, is also based on the fact that at high temperature its viscosity is high. Accordingly, when the concentration of EFK was 1,24%, it was found that the experiment was forced to separate from the sediment by going to 40%.

The most important thing is that in the concentrated EFK content, the amount of magnesium is reduced to sediment at the first stage of the concentration process and does not exceed 1,5% of the maximum.

REFERENCE:

1. I.T.Shamshidinov and b.. Raw materials and their enrichment. The textbook. - T. "Navruz", 2018, -131p.
2. Namazov Sh.S. Seitnazarov A.R. Karshiev B.N. Zakharov E.M. Purification of extraction phosphoric acid from washed burnt phosphoconcentrate using acetic acids. International scientific journal Universum: technical sciences Archive of issues of the journal "Technical Sciences" № 8 (53), 14.08.2018

SSN (Print): 2204-0595
ISSN (Online): 2203-1731

3. N.S.Bakhriddinov. Liquid complex fertilizers based on extraction phosphoric acid from phosphorites of Central Kyzylkum. Abstract of the dissertation of the Candidate of Technical Sciences. -T:, 1991, -25 p.
4. Methods of analysis of phosphate raw materials, phosphorus and complex fertilizers, feed phosphates / M.M. Vinnik, L.N. Yerbanova, P.M. Zaitsev et al. - M.: Chemistry, 1975. - 218 p.
5. GOST 20851.2.75. Methods for determining the phosphorus content. - M.: Publishing House of Standards, 1983.- 22 p.
6. Sobirov, M., Nazirov, R., Khamdamova, Sh., & Tajiev, S. (2020). Intensification of the process of obtaining complex suspended fertilizers with insecticidal activity. MONOGRAPH. https://doi.org/10.36074/tad-sob-naz-ham.monograph
7. Sobirov, Mukhtor M.; Tadjiev, Sayiddin M.; Sultonov, Bokhodir E. Preparation of phosphorus-potassium-nitrogen containing liquid suspension fertilizers with insecticidal activity // Journal of Chemical Technology & Metallurgy . 2015, Vol. 50 Issue 5, p631-637. 7p.

SSN (Print): 2204-0595
ISSN (Online): 2203-1731