HYDROCHLORIC ACID OBTAINING OF PRECIPITATE ON BASE OF KYZYLKUM PHOSPHORITES

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Abstract: *the process of direct production of fertilizer precipitate on the bases of hydrochloric acid processing of phosphorite flour of the Central Kyzylkum, containing 16,60% P_2O_5, 48,62% CaO and 13,02% CO_2, followed by neutralization of the hydrochloric acid phosphate suspension with calcium hydroxide without the filtration step of the insoluble residue are studied. Calcium chloride was leached from the precipitate suspension by double washing with water at the ratio of dry precipitate: H_2O=1:2,5 and 1:2,0. Optimum parameters of decomposition of phosphorite flour and precipitation with hydrochlorophosphoric acid suspension are determined. Under optimum process conditions, samples of precipitate containing 25,06-26,25% P_2O_{5total}, 21,59-22,04% $P_2O_{5assi.}$, 27,03-28,62% CaO_{total} and 23,38-24,41% $CaO_{assi.}$ were obtained. The degree of precipitation of phosphoric acid under optimal conditions was 94,18-97,44%.*
Keywords: *phosphorite flour, hydrochloric acid, precipitate, degree of precipitation.*

СОЛЯНОКИСЛОТНОЕ ПОЛУЧЕНИЕ ПРЕЦИПИТАТА НА ОСНОВЕ КЫЗЫЛКУМСКИХ ФОСФОРИТОВ

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Аннотация: *изучен процесс прямого получения удобрительного преципитата на основе солянокислотной переработки фосфоритовой муки Центральных Кызылкумов, содержащей 16,60% P_2O_5, 48,62% CaO и 13,02% CO_2 с последующей нейтрализацией солянокислотно-фосфатной суспензии с гидроксидом кальция без стадии фильтрации нерастворимого остатка. Для выщелачивания хлорида кальция из преципитатной суспензии была применена двухкратная промывка водой при соотношении сухой преципитат:H_2O = 1:2,5 и 1:2,0. Определены оптимальные параметры разложения фосфоритовой муки и преципитирования солянофосфорнокислотной суспензии. При оптимальных условиях процесса получены образцы преципитата, содержащие 25,06-26,25% $P_2O_{5общ.}$, 21,59-22,04% $P_2O_{5усв.}$, 27,03-28,62% $CaO_{общ.}$ и 23,38-24,41% $CaO_{усв.}$. Степень преципитирования фосфорной кислоты в оптимальных условиях равнялось 94,18-97,44%.*
Ключевые слова: *фосфоритовая мука, соляная кислота, преципитат, степень преципитирование.*

The main actual tasks in the field of production of phosphor contents fertilizers are the following: increase in the volume of their production, expansion of their assortment, involvement in processing of poorer raw materials and decrease of the cost of production. In the conditions of an acute deficit of phosphate fertilizers due to the limited volume of high-quality phosphate raw materials, it is necessary to find effective ways of utilizing phosphor contents waste and involving poor phosphate raw materials in the production of high efficiency phosphate fertilizers.

In connection with the sulfuric acid deficiency, in the production volume is provided process of hydrochloric acid processing of low-grade phosphorites of the Central Kyzylkum with obtaining high concentrated single-phosphoric fertilizer of precipitate - $CaHPO_4 \cdot 2H_2O$. Precipitate is a good fertilizer, suitable for use on all types of soils and for all crops. Apply the precipitate only for the main application. At us production of single phosphoric fertilizers, such as precipitate, enriched and double superphosphates are absent.

The hydrochloric acid process is most expedient first of all for those regions where cheap and excess hydrochloric acid is produced, for example, in the production of sodium or potassium sulfate from chlorides, in the electrochemical production of chlorine, in the hydrolysis of chlorides, etc. Under our conditions, the cheapest

and most accessible reagent can become hydrochloric acid, which is a large-scale collateral product of the production of caustic soda at JSC «Navoiazot», which has very limited sales.

In the present work, we studied the possibility of direct preparation of fertilizer precipitate on the base of hydrochloric acid processing of ordinary phosphorite flour (OPF) from Kyzylkum phosphorites, followed by precipitation of hydrochloric acid phosphate extract by suspension of calcium hydroxide to pH 5,0 and separation of solid precipitate from the liquid phase (calcium chloride solution) by the filtration method, without the step of separating the insoluble residue from the extract.

For laboratory experiments used high-carbonate OPF contents (wt.%): 16,60-P_2O_5; 48,62 - CaO; 13,02 - CO_2; 1,48 - F; 0,12-Cl; 1,48-SO_3; 0,70 - Fe_2O_3; 0,98 - Al_2O_3; 9,1-i.r.; CaO: P_2O_5 = 2,93.

The norm of hydrochloric acid was taken 100% from stoichiometry to decomposition of CaO in the raw material. The concentration hydrochloric acid varied from 25 to 32%. To obtaining acidic pulp was added with water in such an amount that in the suspension the moisture content was 70-80% of the total weight.

Then, the dilute hydrochloricphosphoric acid suspension was neutralized with suspension of calcium hydroxide to pH = 5,0. The neutralized pulp was then filtered out on a Buchner funnel, with discharge of 0,65 mm mer. st. through two layers of filter paper. The wet residue remaining on the filter was washed twice with hot water (90°C) at a dry weight ratio of dry precipitate: H_2O = 1: 2.5 and 1: 2.0. The washed residue was dried together with the filter paper in an oven at a temperature of 90°C. Then the dried precipitate was analyzed [1,2].

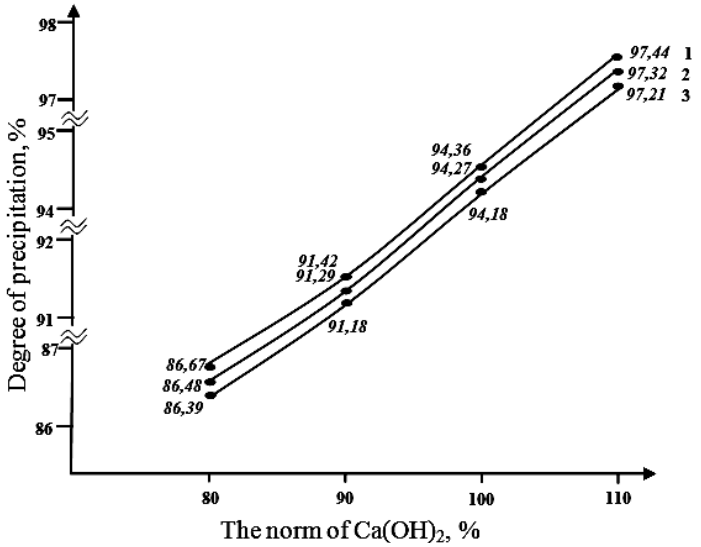

Fig. 1. Dependence of the degree of precipitation of the hydrochloric acid phosphate pulp on the norm of $Ca(OH)_2$. Concentration of HCl, %: 1 - 25; 2 - 30 and 3 - 32

At the figure shows the dependence of the degree of precipitation of the hydrochloric acid pulp on the norm of the precipitant and the concentration of the initial hydrochloric acid.It is seen from it that the higher the norm of the precipitant - $Ca(OH)_2$, the more complete the degree of precipitation.

Concentrations of hydrochloric acid have not significant effect on the degree of precipitation of phosphoric acid. The optimum norm of calcium hydroxide for precipitation can be considered 100-110% of stoichiometry. Here with degree of precipitation is in the range of 94.18-97.44%.

It should be noted that the main problem in the hydrochloric acid method of obtaining fertilizer or feed precipitates from phosphate raw materials is the utilization of solution of calcium chloride, which is process waste. In the calcium chloride formed in our case, it can be used as an inhibitor of corrosion of reinforcement in road construction and in the manufacture of tiles for sidewalks. It can also be converted with sodium chlorate to calcium chlorate, which is the main intermediate product in the production of calcium chloride defoliants.

The outcome of this, on the base of the results of laboratory studies, it was shown that it is possible in principle to obtain fertilizer precipitate by hydrochloric acid processing of high carbonized phosphorites of the Central Kyzylkum, followed by neutralization of the hydrochloric acid pulp by suspension with calcium hydroxide, pulp filtration and drying of the product.

References / Список литературы

1. *Vinnik M.M., Erbanova L.N. and Zaitsev P.M.* // Methods of analysis of phosphate raw materials, phosphoric and complex fertilizers, food phosphates. Moscow. 1975. p. 218.
2. *Dorokhova E.N., Prokhorova G.V.* //Analytical chemistry: Physical-chemical methods of analysis. Moscow. 1991. p. 302.