

**Development of processing technology of the Central Kyzylkum's  
phosphorites using nitrous gases  
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**Разработка технологии переработки Кызылкупмских фосфоритов  
с использованием нитрозных газов  
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**Abstract:** *the article analyzes new ecologically effective way of recycling departing gases of the nitric industry in processing of low-grade phosphorites of manufacture of mineral fertilizers.*

**Аннотация:** *в статье анализируются разработка нового экологически эффективного способа утилизации выбросных газов азотной промышленности в переработке низкосортных фосфоритов производства минеральных удобрений.*

**Keywords:** *phosphate rock, nitrogen-phosphorus calcium fertilizer, aqueous suspension, pulp, nitrous gases, calcium nitrite and nitrate.*

**Ключевые слова:** *фосфатное сырье, азотно-фосфорно-кальциевое удобрение, водная суспензия, пульпа, нитрозные газы, нитрит -, нитрат кальция.*

As it is known that greenhouse gases - gaseous constituent of atmosphere natural or human origin that absorb and emit radiation in the infrared range including the Earth's surface and atmosphere cloud. Anthropogenic increase in atmospheric concentrations of greenhouse gases leads to an increase in surface temperature and climate change. List of greenhouse gases subject for limitation within the United Nations Framework Convention on Climate Change framework (1992) defined in Appendix «A» to the Kyoto Protocol (signed in Kyoto (Japan) in December 1997, 159 States) and includes carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O, NO<sub>2</sub> and NO), per fluorocarbons (PFCs), hydro fluorocarbons (HFCs) and sulfur hexafluoride (SF<sub>6</sub>). Nitrogen oxides (N<sub>2</sub>O, NO<sub>2</sub> and NO) - the third most important greenhouse gas of Kyoto Protocol. Emitted the producing and using of mineral fertilizers, chemical industry, agriculture, etc. It accounts for about 6 % of the global warming.

In public corporation «Navoiazot» is being released into the atmosphere large amount of oxides of nitrogen. In 2010, the emission of these gases is estimated at 377 tons in the amount of N<sub>2</sub>O, NO<sub>2</sub> and NO (on the calculation of one shop).

Dispersion of N<sub>x</sub>O<sub>y</sub> comes away within 20 - 30 km or more, which is the cause of environmental degradation of the atmospheric environment, with all the negative ones in the flesh to reduce the life expectancy of the Navoi region and the neighboring regions of Bukhara and Samarkand region.

Nitrogen oxides very negatively effect on a human body, causes flushing, molasses pulmonary arteries expand even a slight amount of concentrations leads to irritation of the mucous membranes of the gastrointestinal tract, bronchial disease and pneumonia, as well as dental caries. Such kinds of diseases are often common in these areas, especially in the city of Navoi. Therefore, acute critical issue in a number of years is the problem of reducing the emission of these gases in the atmosphere.

Although there are numerous methods of trapping, sterilization and disposal of these gases, however, remains a challenge to develop more effective ways to use the waste gas for various purposes. In this regard, our research developed a method for using these gases in the processing of low-grade phosphate rock of the Central Kyzyl Kum [1].

The aim of our research was to study and provide a method of enrichment of low-grade phosphate rock with nitrous gases, allowing for nitrite - nitrate calcium and enriched concentrate that can improve the environmental and economic situation in the region. Address the following urgent issues:

- Improvement of the ecological situation in the region by reducing the amount thrown nitrous gases into the environment;
- More efficient use of nitrous gases and low-grade phosphate rock, as a waste of chemical and mining industries.

These problems are almost solved that thrown nitrous gases with low concentration of nitrogen oxides (0,6-0,9 % N<sub>x</sub>O<sub>y</sub>) are bubbling absorption of an aqueous suspension of low-grade phosphate rock compositions (1. P<sub>2</sub>O<sub>5</sub> - 15-17 %; CO<sub>2</sub> - 16%; CaO - 46% 2. P<sub>2</sub>O<sub>5</sub> - 18-20 %; CO<sub>2</sub> - 19 %; CaO - 49 %).

For this reason, the initial stage in an aqueous suspension in a special apparatus (reactor) (W:C = 2:1) is treated with nitrous gases to form a slurry (pH = 2). The resulting nitrate nitro phosphate slurry separated, the precipitate is washed and dried. The mother liquor remaining after separation of the pulp is used instead of water

for subsequent processing phosphorus portions at a weight ratio  $W: C = 2:1$ . The resultant slurry ( $pH = 6-5$ ) on the exhaust-gas was bubbled nitrous gases at a temperature of  $25 - 35^{\circ}C$  to a  $pH = 0,5 \div 1,5$  for 120 minutes. Thereafter, the concentrate was separated by filtration of nitro phosphate formed nitrite nitro phosphate slurry, which if necessary is neutralized with ammonia to  $pH$  or  $DAR = 2,2 \div 4,5$ .

The reactor under the action of nitrous gases in the aqueous suspension calcining processes occur phosphorite carbonate, dissolution and activation phosphate components of the phosphate group with the conversion in the hydro - or dihydrogenphosphate. At the end of the experiment the carbonate content in the solid phase decreases from 0.6 to 19.03 %, while in the liquid phase the presence of carbonates or bicarbonates were found. The degree of decarbonization phosphorite 91.33 %, that is, the quality of phosphorite source improves. The amount of basic components -  $P_2O_5$  in the solid phase increases from 15.66 % to 22.8, 18.8 to 27.2 %, from 9.75 to 17.62 %, respectively for 1 and 2 composition.

It is established that in the processed products of phosphate rock, formed components, improve the structure and fertility of the soil. The following data informs about: assimilated form of  $P_2O_5$  is: on the citric acid – 60 %, at trilon B – 50 %, in water-soluble form – 30 %, calcium module ( $CaO/P_2O_5$ ) down from 2.62 to 1.45 % 1 for composition and from 2.4 to 1.36 % for the 2 trains that clearly shows the high quality features of the final product of a phosphorite

The proposed method is highly effective by the fact that there is no special technical difficulties can be done directly in the chemical plant, which produces nitric acid. Thus, as a mild acid exchange - decomposing phosphate reagent use nitrogen oxides ( $N_xO_y = 0.63 - 0.90\%$ ,  $\rho$  of gas =  $2.4 \text{ kg/s cm}^2$ ,  $t^0 = 50-60^{\circ}C$ ), leaving the absorption column.

As a result of experimental research absorption process thrown nitrous gases with a low concentration (1 %) in the actual operating conditions ( $P = 2.2 - 2.5 \text{ atm}$ ,  $v = 8 \text{ l/min}$ ,  $W: C = 2:1$ ) is reached lowering content of thrown nitrogen oxides in the atmosphere 0.7 % - 1.0 % and 0.015%, i.e. at least 8.2 times. This is well below the required environmental standards (0.02 %), oxides of nitrogen emissions into the environment. Thus, the degree of utilization of nitrogen oxides emitted to the atmosphere is achieved to 98.3 % [2-3].

The effectiveness of the technology is determined by the decrease in the number of air thrown nitrous gases to the required minimum, the lack of spending on the catalytic purification of nitrous gases, heat and power conversion costs of phosphate raw materials, the possibility of inclusion of off-balance and low-grade phosphate rock. Cost of nitric acid produced by public corporation «Navoiiazot» through the use of nitrous gases and generate additional phosphorous concentration drops by 38,950.7 million soums, which indicates to sufficient ecological - effectiveness of the developed method.

### References

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