

Объединение независимых экспертов в области минеральных ресурсов,
металлургии и химической промышленности



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Phosphorous Fertilizers in Kazakhstan: Production, Market and Forecast

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Annotation

This report is the **first publication** of the research of the market of phosphorous fertilizers in Kazakhstan.

The **purpose of the study** is the analysis of the Kazakhstan market of phosphorous fertilizers.

The **objects of study** are phosphorus-containing fertilizers, particularly superphosphate and ammophos.

This work is a **desk research**. As **information sources**, data of the Agency of Statistics of the Republic of Kazakhstan, the UN database in foreign trade, the database of "InfoMine", the materials of the sectoral and regional press, annual and quarterly reports of companies, as well as web-sites of companies-producers were used.

In addition, in preparation of the report materials of interviews with specialists of companies, that release these products, were also used.

The **chronological scope of the study**: 2002-2012; the forecast - 2013-2020.

The **geography of research**: the Republic of Kazakhstan - a comprehensive detailed analysis of the market.

The report consists of 6 sections, contains 64 pages, including 14 figures and 13 tables.

The **first chapter** of the report presents brief characteristics of the production technology of phosphorous fertilizers, the data on the raw materials used in Kazakhstan.

The **second chapter** is devoted to the analysis of the release of the product concerned in Kazakhstan in 2002-2012. The data on the volume and structure of production, the current conditions of the major manufacturer are presented; its contact information is given.

The **third chapter** presents data on the dynamics of the domestic prices (in comparison with those in the Russian Federation and Ukraine), and export-import prices on the product.

The **fourth chapter** of the report analyzes foreign trade operations with phosphorous fertilizers in the considered period of time in physical and monetary terms. It presents the amounts and directions of export-import supplies of various types of fertilizers, and highlights the key trends.

The **fifth chapter** is devoted to consumption of the considered products in Kazakhstan in 2002-2012. The balance of the production-consumption of fertilizers by types is given, and the current state of the agro-industrial complex of the country is described.

In addition, this section considers the methods of storage and disposal of the primary waste of production of phosphorus fertilizers - phosphogypsum. The environmental problems associated with its storage and prospects of its use are described.

The **sixth chapter** of the report presents a forecast of development of the Kazakhstan market of phosphorous fertilizers according to the program of development of the chemical industry of Kazakhstan for the period up to 2014.

The target audience of the study:

- Participants in the fertilizer market - producers, consumers, traders;
- Potential investors.

This research claims to be a **reference tool** for marketing services and for specialists, making management decisions on the fertilizer market.

Introduction

Until relatively recently, the class of *phosphorous* fertilizers included a number of products, containing in its composition only one kind of nutrients - phosphorus. In this regard, the nomenclature of this kind of production was limited and included only a few items, among them simple and double superphosphate.

However, a few decades ago, in accordance with the requirements of an effective agriculture, interested in using universal brands of fertilizers containing several useful components, there have been developed and put into production a group of products, called double (containing both N and P) and triple (N, P and K) *phosphate fertilizers*.

To simple phosphorous fertilizers, as already mentioned, belong superphosphate and ground phosphorite. The class of phosphate fertilizers includes ammophos (MAP), diammonium phosphate (DAP), ammonium nitrate phosphate fertilizer (ANP), etc.

1. Technology of production of phosphate fertilizers, raw materials used in Kazakhstan

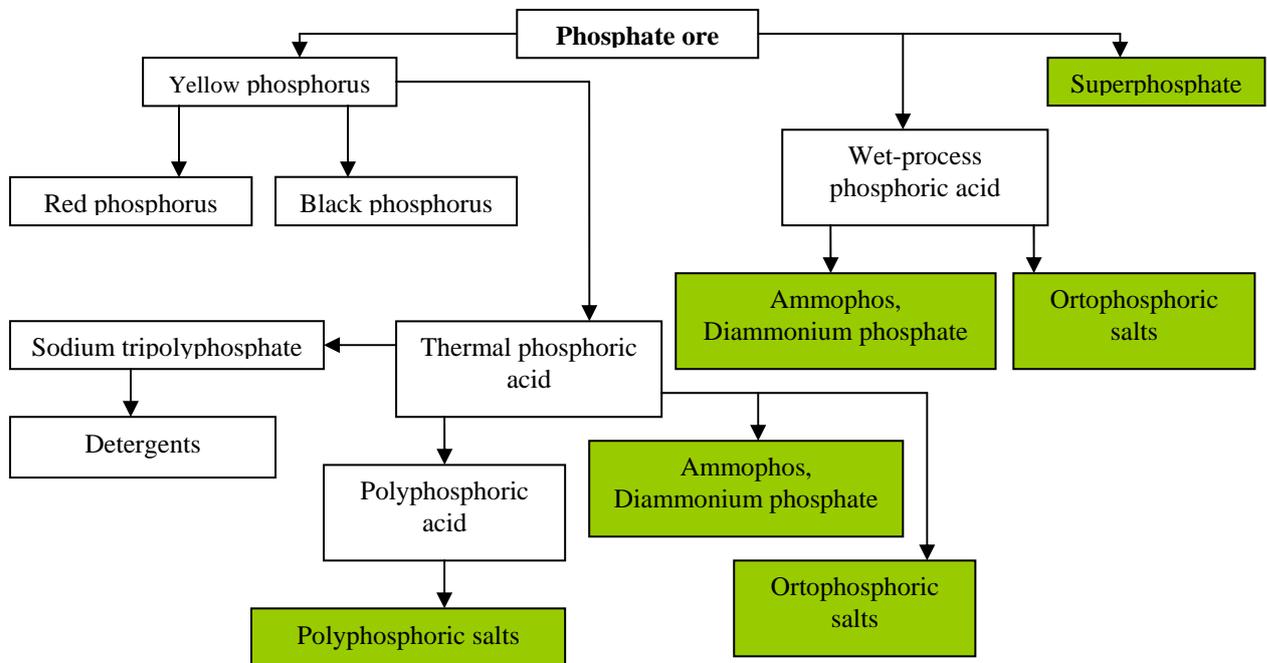
In general, the raw materials for production of phosphates are natural minerals apatite and phosphorite. **Apatite** is a rock of a volcanic origin, which has a coarse-grained structure and, in addition to fluorine(hydroxyl)apatite, contains non-phosphate minerals, the main of which is nepheline of the composition $\text{Na}_2\text{O}(\text{K}_2\text{O})\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$.

Phosphorites are sedimentary ores, which are finely-dispersed and contain phosphorus in the form of fluorapatite and apatite-like minerals of variable composition. The content of phosphorus in phosphorites ranges from 11 to 30% P_2O_5 .

Phosphates are the only significant source of phosphorus (P_2O_5) for plants. In agriculture, for the production of chemical fertilizers and feed additives about 85% of the produced phosphate is used. The remaining 15% are used in various industries, leaders among which are the production of detergents (12%) and the production of phosphorus (about 3%).

About 30% of extracted phosphate is used directly for the release of the final product - fertilizers and feed additives. The other two-thirds are processed into the intermediate product - phosphoric acid. Phosphoric acid with P_2O_5 of various concentrations is used in the production of fertilizers, fodder additives with a higher content of phosphorus and in the industry (Figure 1).

Figure 1. The application of phosphates

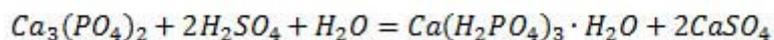
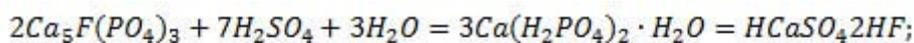


Source: review of the technical literature

Methods of processing phosphate materials depend strongly on the composition of the ore and can be mechanical or chemical. By mechanical processing (milling) a simple phosphate fertilizer - *ground phosphorite* - is obtained. The task of the chemical processing of natural phosphates into phosphate fertilizers is the conversion of insoluble tricalcium phosphate into phosphorus compounds, which are easily absorbed by plants and are highly concentrated, i.e. contain the largest possible amount of P₂O₅ in digestible form with a minimal amount of ballasts and contaminants.

The most common method of processing phosphate rocks is decomposition by sulfuric, phosphoric or nitric acids.

So, *simple superphosphate* is prepared by treating the milled apatite or phosphate rock with sulfuric acid. At this, the decomposition of apatite or phosphorite undergoes with the formation of water-soluble calcium monobasic phosphate Ca(H₂PO₄)₂ and gypsum CaSO₄, which is insoluble in water:



Gypsum remains in the fertilizer and amounts to about 40% of its weight. Phosphorus in such superphosphate is almost half that of the feedstock. For this reason, low-percentage phosphorites are not used for the production of superphosphate. Digestible phosphorus in superphosphate is only 14-19.5% of the total mass.

With the neutralization of superphosphate with ammonia the *ammoniated superphosphate* is obtained with a nitrogen content of about 1.5-3%.

Double superphosphate, unlike simple, has a high content of digestible phosphorus recalculated to P₂O₅ - 42-49%, and contains no gypsum. Phosphorus is present therein in the form of water soluble monocalcium phosphate Ca(H₂PO₄)₂·H₂O and a small amount of free phosphoric acid (2.5-5%). In the production of double superphosphate materials are also treated with sulfuric acid. It is taken in larger amounts than for the production of simple superphosphate, in order to obtain not monocalcium phosphate, but phosphoric acid, which is then treated with a new batch of material to prepare double superphosphate.

The cost of P₂O₅ in double superphosphate is by 20% higher than in the production of simple superphosphate. However, this is offset by the savings in transportation, storage and application to the soil of a more concentrated fertilizer - double superphosphate.

All *complex fertilizers* according to the method of their manufacture can be divided into three groups:

- Fertilizers obtained in processing by phosphoric acid (ammophos, diammonium phosphate);
- Fertilizers obtained in processing by a mixture of phosphoric and nitric acids (nitroammophos, ammonium nitrate phosphate fertilizer (ANP) or nitroammophoska);