GEOLOGICAL AND MINERALOGICAL PROPERTIES OF PHOSPHATE RAW MATERIALS

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Abstract: *This article provides information on phosphorite raw materials, production of phosphorous fertilizers, production of phosphorous fertilizers with high technical and economic indicators.*

Key words: *phosphate raw materials, phosphorite, nitrogen, phosphorus, potassium, low-grade ores, phosphate ores, USA, Morocco, China, Russia, Mexico, Kazakhstan, Peru, South Africa, carbonate rocks, technical and economic indicators.*

Phosphorous fertilizers produced in the world are obtained on the basis of apatite and phosphorite concentrates, and their reserves are decreasing year by year. is going

To date, it can be seen that the global consumption of phosphate raw materials has increased by 190 million tons per year, or 43 million tons in terms of P2O5. According to forecasts, the consumption of phosphate raw materials is expected to increase by 2 million tons per year until 2030. By 2050, annual phosphate feedstock consumption will reach 220 million tons, or about 70 million tons of P2O5

Since the middle of the last century, with the increase in the consumption of fertilizers, there has been a great need to improve the methods of enrichment of low-grade ores, to clean them as much as possible from foreign additives and to make them suitable for processing in order to increase the amount of main components.

According to the UN, the world's population has increased from 3.7 billion in 1970 to 7.8 billion by 2021, and is expected to exceed 15 billion in 2075. The largest growth is accounted for by the Asian continent. Due to the increase in population, the problem of development of food and technical crops remains acute. Such problems can be solved by expanding the base of raw materials for the production of high-quality mineral fertilizers, and accelerating production technologies.

Globally, the demand for fertilizers is increasing in proportion to population growth. By the end of the first decade of the 21st century, the annual consumption of phosphate raw materials reached 166 million tons. As a result, the production of phosphate raw materials is increasing. Despite the huge reserves of phosphate ores in the world, they cannot cover the consumption of depleted resources and the return of phosphorus in its natural state in the natural cycle. At the same time, the growth of

food production requires new land that cannot be farmed without fertilizers, so the consumption of phosphate raw materials may increase dramatically compared to population growth.

Global proven reserves of phosphate ores are accounted for by more than 60 countries, amounting to 70.6 billion tons in terms of R2O5, of which 65.3 billion tons are from phosphorite and 5.3 billion tons from apatite ores. 87% of the world reserves are concentrated in 10 countries - USA, Morocco, China, Russia, Mexico, Kazakhstan, Peru, South Africa, Western Sahara and Tunisia. The amount of R2O5 in phosphate raw materials mined by different countries varies from 21 to 38.2%. The best phosphate raw material is Xibin apatite concentrate in Russia. There are only five main sources of phosphate ores in the world: 1) marine sedimentary deposits, 2) igneous deposits, 3) metamorphic deposits, 4) biogenic deposits, and 5) phosphate deposits formed by environmental remediation.

Depending on the occurrence, there may be igneous and sedimentary phosphates. Apatite (igneous rock) is formed by the direct solidification of volcanic lava (pegmatite chains) or separation from hot water solutions (hydrothermal formations), or by the interaction of lava with carbonate rocks such as limestone. Therefore, apatite rocks have a granular structure in the crystalline state, characterized by polydispersity and the absence of micropores.

In both types of raw materials, the phosphate material is apatite group minerals with the general formula 3Me3(PO4)2•CaX2, where Ca2+ is represented by Me, and fluorine, chlorine, and OH group are represented by X. Calcifluorapatite 3Ca3(PO4)2•CaF2 or Ca5(PO4)3F, as well as hydroxylapatite 3Ca3(PO4)2•Ca(OH)2 or Ca5(PO4)3OH are the most common in nature.

In apatite ores, in addition to apatite, the following minerals are: sodium and aluminum silicates - nepheline (Na, K)AlSiO4•nSiO2, sodium and iron silicates - egirin NaFe(SiO3)2, etc., titanomagnetite Fe3O4•FeTiO3•TiO2, ilmenite FeTiO3, sphene CaTiSiO5,, there will be feldspars, black mica, eudalites. Phosphorite ores include the following minerals and additives: glauconite - hydrous silicate type [(R2O+RO)•R2O3•4SiO2•2H2O], where R2O is Na2O and K2O, RO is MgO, limonite Fe2(OH)6•Fe2O3, calcite CaCO3, , dolomite CaCO3•MgCO3, magnesium silicates Mg2SiO4,, kaolin Al2O3•SiO2•2H2O, pyrite FeS2, feldspar, quartz, granite and organic matter.

One of the largest producers of phosphates in the world is JSC "Apatit" of the Russian Federation, which produces flotation apatite concentrate. The ore reserve of "Apatit" JSC is apatite-nepheline ore deposits located in the alkaline area of Khybin.

North Africa has the world's largest reserves of phosphorite, which occur in the form of marine sediment deposits. Morocco is the third largest producer of phosphate raw materials in the world and the first exporter.

Kunyan mine (38 km from Kunming, the capital of Yunman province) is the richest in ores in China. China ranks fourth in the world in terms of phosphate raw

material production, and third in terms of its consumption. More than 180 mines have been built in China to extract phosphate raw materials. The content of R2O5 in phosphorites is 20-32%, and it is carbonated or silicate-carbonate.

The phosphate industry of the Central Asian countries is based on the phosphorites of Karatog (Republic of Kazakhstan) and Central Kyzylkum (Republic of Uzbekistan).

As a result of geological exploration in the territory of the Republic of Uzbekistan, the largest deposit of granular phosphorites was found in the Central Kyzylkum (MQ) basin, where there are twelve most promising areas of Middle Eocene sedimentary rocks. Kyzylkum phosphorites are not similar in terms of physico-chemical properties, but they are similar to phosphorites of deposits of North Africa, the Middle East and Afghanistan, typical of carbonate groups of the Mesozoic formation.

Uzbekistan, like Russia and Kazakhstan, has its own phosphate raw material base for the production of phosphorus fertilizers. Phosphorite deposits exist in many regions of Uzbekistan (Central Kyzylkum, Surkhandarya, Karakalpakstan, Fergana and others). Among them, phosphorite deposits in Central Kyzylkum (MQ) area are the most promising from the point of view of industrial utilization. To date, a large number of phosphorite deposits and four deposits of granular phosphorite (Etimtog, Jer-Sardor, Tashkora and Karaqat) have been identified in the Central Kyzylkum region, which account for more than 50% of the prospective phosphate (P2O5) resources in the area.

The phosphorite basin of Central Kyzylkum covers an area of about 65,000 km2. If we assume that only 5% of this area is covered by industrial phosphorite, the predicted reserve of phosphorite with an average layer thickness of 2.5 meters is 16.25 billion tons, or 1.95 billion tons of P2O5 (average content of P2O5 - 12%). organizes. Marl granular phosphorite ores were identified and studied in detail in the area of 3000 km2 of Kyzylkum. Phosphorite resources up to a depth of 300 m are estimated at 10 billion tons (this is about 2 billion tons of P2O5), including 1.0-1.2 billion tons of ore (or 200-240 million tons of P2O5) at a depth available for open-pit mining (up to 60 meters). constitutes

The North Etimtog mine is located in the Tomdi district, 75-80 km north-east of the town of Tomdibulok. The reserves are confirmed to be 50 million tons of ore (more than 10 million tons of P2O5), with an average of 20.25% P2O5. In terms of technological properties, the raw material is similar to the raw material from the Jer-Sardor mine. In the eastern and southeastern part of the mine, to a depth of 50 meters, the reserve of C2 granular phosphorite ore is 142 million tons (or more than 28 million tons of P2O5 when it contains 19.8-22.7% P2O5).

The Karakat mine is located 55 km south-east of the Muruntog village, in the Konimekh district. The mine consists of two sections: Aznek and Ayakkuduq. According to forecast sources, the ore in the Aznek part of the Karaqat deposit is 27 million tons (or 4.9 million tons of P2O5 if it contains 18.29% P2O5) and the ore in the

Ayakkuduk section is 16 million tons (or 3.3 million tons if it contains 20.54% P2O5 tons of P2O5) is estimated to be.

Physico-chemical description of Central Kyzylkum phosphorites was studied in detail using modern methods.

From the given data, it is clear that phosphorite raw materials go through multi-stage processes before the production process of phosphoric fertilizers. In addition, such raw materials have limited reserves like other raw materials. Therefore, it is important to establish the production of concentrated phosphorus fertilizers with high technical and economic indicators by processing the semi-finished EFK obtained from phosphorites in unconventional ways.

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