InfoMine research group

Association of independent experts in field of mineral resources, metallurgy and chemical industry

Diatomite Market Research in the CIS and Forecast of Its Development in the Crisis Conditions

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Annotation

The report is devoted to research of current standing of market of diatomite in the CIS and forecast of its development. The report is composed of 8 Sections, contains 99 Pages, including 19 Figures, 64 Tables and 1 Appendix. This work is a desk study. As information sources, we used data of Rosstat, Federal Customs Service of Russia, Russian domestic railage statistics, CIS Inter-State Committee on Statistics, sectoral and regional press, as well as web-sites of company-producers of diatomite.

The first Section of the report presents brief characteristics of world market of diatomite.

The second Section of the report presents data on deposits of diatomite and their reserves in the CIS.

The third Section of the report is devoted to processes of production diatomite products and requirements, imposed on quality of diatomite resources.

The fourth Section of the report presents data on volumes of mining of diatomite in the CIS in 1999-2008. Besides, the Section describes current standing of company-producers of diatomite in CIS countries. The Section presents data on volumes of mining, characteristics of manufactured products, directions and volumes of the supplies, as well as plans on further development of the production.

The fifth Section of the report analysis data on foreign trade operations in diatomite in Russia, Ukraine and Armenia in 1999-2008.

The sixth Section presents data on domestic and export-import prices on diatomite in Russia, as well as export-import prices in Ukraine and Armenia.

The seventh Section of the report is devoted to analysis of domestic consumption of diatomite in Russia. It presents sectoral pattern of consumption of diatomite, data on directions and volumes of the supplies and the main consumers of diatomite products in Russia. Besides, the Section presents supply-demand balance of diatomite products in Ukraine.

The final, eighth Section of the report gives forecast of production and consumption of diatomite in the CIS.

The Appendix presents addresses and contact information on producers of diatomite in the CIS.

Introduction

Diatomite is a chalk-like, soft, friable, earthy, very fine-grained, siliceous sedimentary rock, usually light in color (white if pure, commonly buff to gray in situ, and rarely black). It is very finely porous, very low in density (floating on water at least until saturated), and essentially chemically inert in most liquids and gases. It also has low thermal conductivity and a rather high fusion point.

Diatomaceous earth (often abbreviated as D.E.) is a common alternate name but is more appropriate for the unconsolidated or less lithified sediment. Diatomite is also known as kieselguhr (Germany), tripolite (after an occurrence near Tripoli, Libya), and moler (an impure Danish form). Alfred Noble named his explosive invention, dynamite, following his discovery that nitroglycerin could be stabilized if first absorbed in diatomite (Nobel, 1868).

Diatomite deposits form from an accumulation of amorphous hydrous silica cell walls of dead diatoms in both oceanic and fresh waters. These microscopic single-cell aquatic plants (algae) contain an internal, elaborate siliceous skeleton consisting of two frustules (valves) that vary in size from less than 1 micrometer (μm) to more than 1 millimeter in diameter, but are typically 10 to 200 μm in diameter. The frustules have a broad variety of delicate, lacy, perforated shapes, including cylinders, discs, feathers, ladders, needles, and spheres. The oldest occurrences are thought to be of Cretaceous age, deposited about 66 million to 138 million years ago. Older diatomite occurrences may have been altered into other forms of silica, particularly chert, owing to diagenesis, burial, and exposure. Detailed information on the geology of diatomite can be found in Wallace (2003) and Moyle and Dolley (2003).

The typical chemical composition of diatomite is 86% silica, 5% sodium, 3% magnesium and 2% iron. Diatomite has low density (0.5-0.8 g/cm^3) and high specific surface (porosity 70-75%).

Specific properties of diatomite owe its multi-purpose industrial use (Fig. 1).

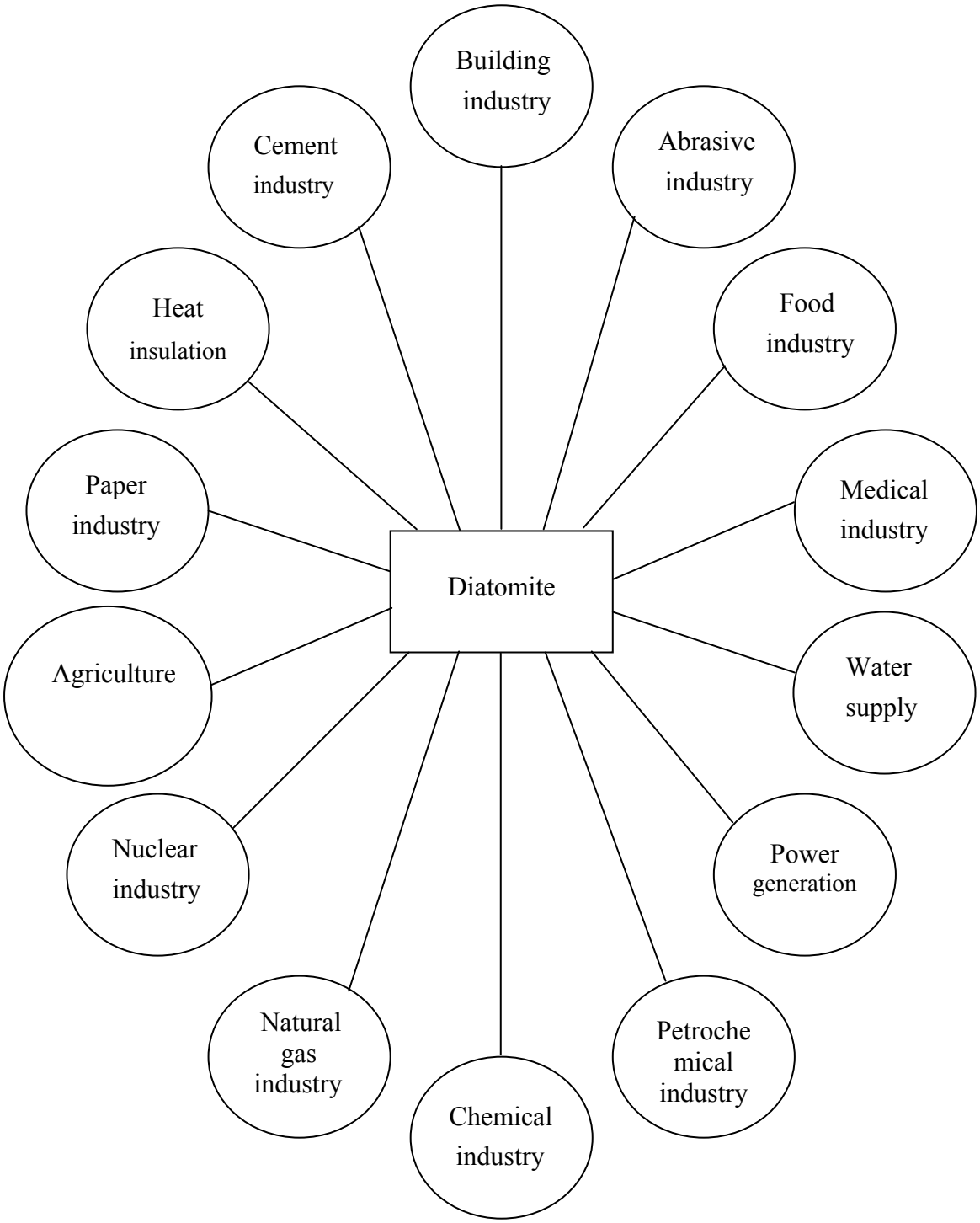
In the world, diatomite is now used principally as a filter aid; but it has many other applications, such as an absorbent for industrial spills and as pet litter, a filler in a variety of products from paints to dry chemicals, an insulation material as sawn and molded shapes as well as loose granular, a mild abrasive in polishes, and a silica additive in cement and various other compounds.

Filtration (including the purification of beer, liquors, and wine and the cleansing of greases and oils) continued to be the largest end use for diatomite, also known as diatomaceous earth. An important application for diatomite is the removal of microbial contaminants, such as bacteria, protozoa, and viruses in public water systems. Other applications for diatomite include filtration of human blood plasma, pharmaceutical processing, and use as a nontoxic insecticide.

In CIS/Russia, the great bulk of diatomite is consumed in manufacture of building and heat-insulating materials (see below in details) – as hydraulic additive (up to 6% of clinker) in manufacture of white cements (owing to high whiteness of diatomite, which must be at least 72% in this end-use); in manufacture of building brick to provide its low weight (a half of that of common brick), high heat- and

sound-insulating properties, but this brick has less strength and frost resistance; in manufacture of heat-insulating materials and articles (both as natural filling powdery insulation and in form of various roasted and mastic-based articles); and in filtering materials - diatomite is one of key resources for production of filtering powders for food industry (but before the use the diatomite powder should be cleaned from clay and sandy impurities, harmful oxides and organic matter and calcined (at around 1000 °C) to improve considerably properties of the filtering powders).

Figure 1. Fields of application of siliceous rocks



Source: review of scientific-technical literature

Major diatomite products were sold as various grades of calcined powders.

Many materials can be substituted for diatomite. However, the unique properties of diatomite assure its continuing use in many applications. Expanded perlite and silica sand compete for filtration. Synthetic filters, notably ceramic, polymeric, or carbon membrane filters and filters made with cellulose fibers, are

becoming competitive as filter media. Alternate filler materials include clay, ground limestone, ground mica, ground silica sand, perlite, talc, and vermiculite. For thermal insulation, materials such as various clays, exfoliated vermiculite, expanded perlite, mineral wool, and special brick can be used.

Encroachment into diatomite markets by natural and synthetic substitute material remained minimal, particularly for Brewery filtration. Use as a biological filter for human blood plasma continued to grow. Following concerns of free crystalline silica, the use of diatomite as a filler experienced a drop in 2006, but remained constant in 2007.

1. Brief characteristics of world market of diatomite

According to USGS, world resources of crude diatomite are adequate for the foreseeable future. Transportation costs will continue to determine the maximum economic distance most forms of diatomite may be shipped and still remain competitive with alternative materials.

World reserves of diatomite are great, but not estimated exactly. It is known that the largest reserves belong to USA and are now around 500 mln t. According to USGS estimate, production (mining) of diatomite in the world reached peak in 1990 – around 2.7 mln t, with following decline (first of all, at the expense of CIS countries) to 1.8 mln t in 1999. But later (except 2002), volume of world mining of diatomite increased until 2007. In 2007-2008 the volume of diatomite mining in the world began to decrease, and from estimate of USGS, in 2008 was 2 mln t (Table 1). Regional pattern of diatomite mining is presented in Fig. 2.

Table 1. Mining of diatomite in the world in 1999-2008, kt

Country	Mining, kt									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008*
USA										
China										
Denmark										
Japan										
CIS countries										
France										
Mexico										
Other										
Total										

** - estimate of USGS*

Source: «InfoMine» on the basis of data of US Geological Survey (USGS)

Because diatomite occurrences are at or near the earth's surface, recovery from most deposits is achieved through low cost, open pit mining. Outside the United States, however, underground mining is fairly common owing to deposit location and topographic constraints. Explosives are generally not required for surficial or subsurface mining because of the soft, friable nature of the deposits. In Iceland, dredging is used to recover diatomaceous mud from a local lake bottom.

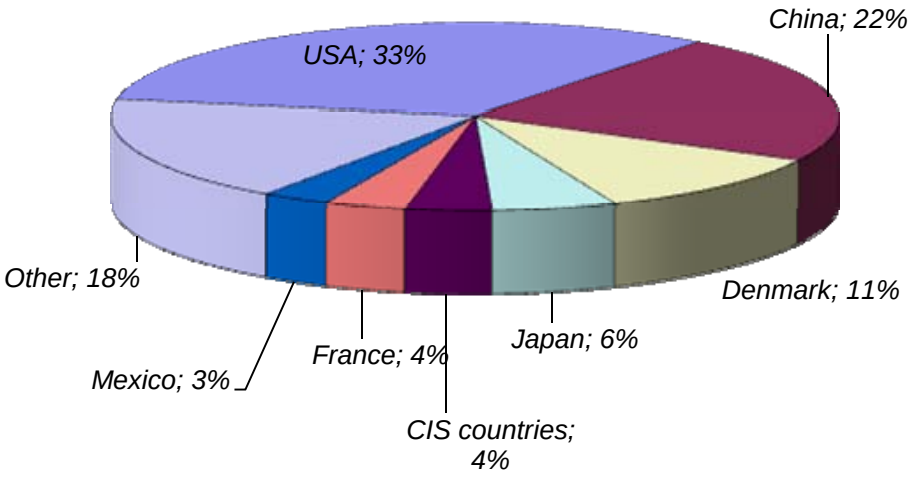
Diatomite is often processed near the mine to reduce transportation costs associated with the crude ore, which can contain up to 65% water. Processing typically involves a series of crushing, drying, size reduction, and calcining operations, using heated air for conveying and classifying within the plant.

Fine-sized diatomite grains, especially from baghouses, are used most often for filler-grade products, while coarser particles are employed for filtration purposes. In

the latter processing stages, calcining is performed in rotary kilns to effect chemical and physical changes.

Leading producer of diatomite in the world is USA, share of which in world production of diatomite is around 33%. In 2008, domestic production of diatomite in USA was estimated at 653,000 tons with an estimated processed value of $163 million, f.o.b. plant. Diatomite is produced by 7 companies, from 12 separate mining areas and 9 processing facilities in California, Nevada, Oregon, and Washington.

Figure 2. Regional pattern of diatomite mining in the world in 2008, %



Source: «InfoMine» on the basis of data of US Geological Survey (USGS)

Major U.S. producers are Celite Corp. (a subsidiary of Imerys USA, Inc.) with mines and facilities in California, Nevada, and Washington, and EP Minerals, LLC (a subsidiary of EaglePicher Corp.) with operations in Nevada and Oregon. California is the leading producing State, followed by Nevada. The combined output of these two States accounted for about 86% of the U.S. production in 2007.

Sectoral pattern of consumption of diatomite in USA, from estimate of USGS, in 2008 was as follows. Diatomite is frequently used in filter aids, 52%; cement additives, 26%; absorbents, 12%; fillers, 9%; and other applications (specialized pharmaceutical or biomedical uses), 1%.

In Table 2, characteristics of diatomite market in USA in 1999-2008 is presented.

Table 2. Characteristics of market of diatomite in USA in 1999-2008, kt, $/t

Parameter	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Production, kt										
Import, kt										
Export, kt										
Apparent consumption, kt										
Average price, $/t										

** - estimate of USGS*

Source: «InfoMine» on the basis of data of US Geological Survey (USGS)

Average prices on diatomite products at market of USA in 2007 are presented in Table 3. As seen from the data, in 2007 prices on all kinds of diatomite products increased.

The unit value (price) of diatomite varied widely in 2008, from less than $9.00 per ton for cement manufacture to approximately $1,000 per ton for limited specialty markets, including art supplies, cosmetics, and DNA extraction. The average unit value for filter-grade diatomite was $373 per ton.

In 2007, prices on diatomite products ranged 3 to 1000 $/t. The average unit value for filter-grade diatomite was $237 per ton (Table 3).

Table 3. Average prices on diatomite products at market of USA in 2007, $/t, %

End-use	Average price in 2007, $/t	Change compared with 2006, %
filtering		
adsorbents		
fillers		
heat-insulating materials		
Average price by all end-uses		

Source: «InfoMine» on the basis of data of US Geological Survey (USGS)

The greatest company at market of diatomite is World Minerals, which mines from its deposits, located in Spain, Iceland, USA, France, china and some other countries around 65% of world consumption of diatomite.

Experts expect the world market of diatomite will be rather stable in nearest years, with insignificant growth of the world production of diatomite that is owed by saturation of the market with increasing prices on power resources. Notice that the forecast was elaborated before starting the global economic crisis, and taking into account this global phenomenon of crucial importance, one can expect some decreasing world production of diatomite in nearest future.

A factor, impeding further expansion of diatomite in filter applications (its key end-use) would be introduction of new high-efficient substitutes. However, previous concerns regarding the encroachment of more advanced filter applications, including carbon membranes, ceramics, and polymers, are not a major concern in recent time. The high costs associated with these alternatives, and a cultural preference toward the use of diatomite in the brewing and wine industries, indicates a strong likelihood for the continued and widespread use of diatomite in filtration.