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2007 Minerals Yearbook

ZEOLITES [ADVANCE RELEASE]

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ZEOLITES

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Domestic survey data and table were prepared by Maria Arguelles, supervisory statistical assistant.

In 2007, natural zeolites were mined by nine companies in the United States with two other companies working from stockpiled materials. Mine production was 57,400 metric tons (t), and U.S. consumption was 57,100 t. The major markets were in animal feed, pet litter, water purification, and odor control, in decreasing order by tonnage. These applications accounted for more than 75% of domestic consumption. Exports and imports of natural zeolite (other than gem-quality) were estimated to be less than 250 t and 350 t, respectively. World production was estimated to be in the range of 2.5 million to 3 million metric tons (Mt).

Commercial zeolite deposits in the United States are associated with the alteration of volcanic tuffs in alkaline lake deposits and open hydrologic systems. These deposits are in Arizona, California, Idaho, Nevada, New Mexico, Oregon, Texas, and Wyoming. Zeolites in these deposits are chabazite, clinoptilolite, erionite, mordenite, and phillipsite. Other components, such as orthoclase and plagioclase feldspars, montmorillonite, opal, quartz, and volcanic glass, are present in some deposits.

Production

Domestic data for natural zeolites were collected by means of a voluntary survey of the domestic mining industry. Survey forms were sent to 11 companies, and 7 responded. Responses accounted for 97% of the production and end-use data.

Conventional open pit mining techniques are used to mine natural zeolites. The overburden is removed to allow access to the ore. The ore may be blasted or stripped for processing by using front-end loaders or tractors equipped with ripper blades. In processing, the ore is crushed, dried, and milled. The milled ore may be air-classified based on particle size and shipped in bags or bulk. The crushed product may be screened to remove fine material when a granular product is required, and some pelletized products are produced from fine material. Producers also may modify the properties of the zeolite or blend their zeolite products with other materials before sale to enhance their performance.

Nine companies mined natural zeolites in the United States in 2007. Two other companies did not mine zeolites during the year but sold from stocks or purchased zeolites from other producers for resale (table 1). Chabazite was mined in Arizona; clinoptilolite was mined and processed in California, Idaho, Nevada, New Mexico, Texas, and Wyoming; and mordenite was mined in Arizona. New Mexico was the leading producer State. Domestic production of zeolites was 57,400 t compared with 63,200 t of production in 2006.

In June, Zeox Corp., Vancouver, British Columbia, Canada, announced that it would purchase most of the assets of GSA Resources, Inc. and the chabazite reserves of Cheto Partners, LLC. GSA Resources, which had a mine and mill operation in Arizona, was one of two producers of chabazite in the United States. Cheto Partners' zeolite reserves also are located in Arizona (Zeox Corp., 2007a).

Zeox also acquired a 100% interest in Ash Meadows, LLC from Badger Mining Corp., Berlin, WI. Ash Meadows operated a clinoptilolite mine and a mill on the California and Nevada border in Amargosa Valley, NV, and sold zeolites for odor control, nuclear waste cleanup, and water filtration. The Ash Meadows operation was incorporated into White Cliffs Mining Inc., an Arizona-based mining company that also was purchased by Zeox in 2007. White Cliffs Mining was renamed as Zeox Minerals Material Corp. (Industrial Minerals, 2007a-c; Zeox Corp., 2008).

Zeox Mineral Materials announced that it had signed a letter of intent to purchase a processing facility in Butte, MT, from MSE Inc., Butte, MT, and Machinery and Equipment, Inc., San Francisco, CA. The facility was expected to be used to process zeolites for the company's existing product lines. Capacity at the facility was 100,000 metric tons per year (Zeox Corp., 2007b, 2008).

Bear River Zeolite Co. (a subsidiary of United States Antimony Corp.) began operation of its new roller mill circuit. The company added the roller mill at its facility in Preston, ID, to produce finely ground zeolite products for use in animal feed (United States Antimony Corp., 2007).

Consumption

About 57,400 t of natural zeolite was sold in 2007 in the United States compared with 55,900 t in 2006. Domestic uses for natural zeolite were, in decreasing order by tonnage, animal feed, pet litter, water purification, odor control, wastewater cleanup, horticultural applications (soil conditioners and growth media), gas absorbent, desiccant, oil absorbent, aquaculture, fungicide or pesticide carrier, and catalyst. Animal feed, pet litter, water purification, and odor control applications, in decreasing order by quantity, accounted for more than 75% of the domestic sales tonnage. Increased sales of natural zeolites were reported for animal feed, desiccant, odor control, pet litter, wastewater treatment, and water purification applications. Sales declined for aquaculture, fertilizer, fungicide and pesticide carriers, gas absorbent, and oil absorbent applications. The largest increases in tonnage sales were for odor control and pet litter, and the largest declines in tonnage sales were for fertilizer, fungicide and pesticide carrier, and oil absorbent applications.

Prices

Prices for natural zeolite vary with zeolite content and processing. Unit values, obtained through the U.S. Geological

Survey canvass of domestic zeolite producers, ranged from $50 to $220 per ton. The bulk of the tonnage sold ranged from $80 and $130 per ton. Eyde and Holmes (2006, p. 1058) reported that prices for industrial or agricultural applications ranged from $30 to $70 per ton for granular products coarser than 40-mesh and from $50 to $120 per ton for finer (-40 to +325-mesh) ground material. For such products as pet litter, fish tank media, or odor control applications, prices ranged from $0.50 to $4.50 per kilogram. Quoted prices should be used only as a guideline because actual prices depend on the terms of the contract between seller and buyer.

Foreign Trade

Comprehensive trade data were not available for natural zeolites. Exports and imports of natural zeolites (other than gem-quality) were estimated to be less than 250 t and 350 t, respectively. The bulk of the U.S. zeolite trade was in synthetic zeolite products.

World Industry Structure

World production of natural zeolite was estimated to be between 2.5 and 3 Mt based on reported production by some countries and production estimates published in trade journals. Estimates for individual countries were China (including pozzolan applications), 1.75 to 2.25 Mt; the Republic of Korea, 160,000 t; Japan, 140,000 to 160,000 t; the United States, 57,400 t; Indonesia, 30,000 to 50,000 t; Turkey, 30,000 to 40,000 t; Hungary, 20,000 to 30,000 t; South Africa, 15,000 to 25,000 t; Cuba, 14,000 t; Bulgaria (excluding pozzolan applications), 10,000 to 15,000 t; Australia, 10,000 to 12,000 t; New Zealand, 9,100 t; Georgia, the Philippines, and Slovakia, 5,000 to 10,000 t each; and Canada, Greece, Italy, and the Commonwealth of Independent States, 3,000 to 5,000 t each. Small amounts of natural zeolite (probably less than 1,000 to 2,000 t) also were produced in Argentina, Germany (excluding pozzolan applications), Jordon (excluding pozzolan applications), Slovenia, Spain, and Ukraine.

In general, countries mining large tonnages of zeolite often use them in low-value applications. The ready availability of zeolite-rich rock at low cost and the shortage of competing minerals and rocks are probably the most important factors for its large-scale use. Also, it is likely that a significant percentage of the material sold as zeolite in some countries is ground or sawn volcanic tuff that contains only a small amount of zeolite. Some examples of such usage are dimension stone (as an altered volcanic tuff), lightweight aggregate, pozzolanic cement, and soil conditioners.

Outlook

U.S. sales of natural zeolites increased at an average rate of almost 9% per year between 1997 and 2007. The rate of growth in sales has slowed in the past 2 years but is still likely to continue to increase, possibly at an average annual rate of 5%, as companies continue to pursue new markets. World sales of natural zeolites probably will continue to increase as traditional markets expand and new applications are developed.

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TABLE 1
DOMESTIC ZEOLITE PRODUCERS IN 2007[1]

State and company	Type of zeolite
Arizona:	
GSA Resources, Inc.	Chabazite.
UOP LLC	Chabazite/mordenite.
California:	
Ash Meadows, LLC	Clinoptilolite.
KMI Zeolite, Inc.	Do.
Idaho:	
Bear River Zeolite Co.	Do.
Teague Mineral Products Co.	Do.
New Mexico, St. Cloud Mining Co.	Do.
Texas, Zeotech Corp.	Do.
Wyoming, Addwest Minerals International Ltd.	Do.

Do. Ditto.

[1]Moltan Co. and Steelhead Specialty Minerals, Inc. worked from stocks or purchased zeolites from other producers for resale.