



2012 Minerals Yearbook

ZEOLITES

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In 2012, natural zeolites were mined by eight companies in the United States. Mine production increased to 74,000 metric tons (t) from 65,400 t in 2011. Consumption increased to 70,500 t in 2012 from 65,200 t in 2011. The major markets for natural zeolites were in animal feed, pet litter, cement (primarily down-hole cement applications by the drilling industry), water purification, odor control, and wastewater treatment, in decreasing order by tonnage. These six applications accounted for more than 70% of domestic consumption. Exports of natural zeolites (other than gem quality) were estimated to be between 500 t and 1,000 t, and imports were estimated to be less than 5 t. World production was estimated to be in the range of 2.7 to 3.2 million metric tons (Mt) (table 1).

Zeolite deposits in the United States are associated with the alteration of volcanic tuffs in alkaline lake deposits and open hydrologic systems. In the United States, these deposits are in Arizona, California, Idaho, Nevada, New Mexico, Oregon, and Texas. 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 13 mines and mills, and responses were received from 8. Responses accounted for 83% of the production and end-use data. Data for nonrespondents were estimated from reported 2011 revised data according to trends in production for reporting zeolites producers and consuming industries and Mine Safety and Health Administration (MSHA) employment 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.

Eight companies mined natural zeolites in the United States in 2012 (table 2). Chabazite was mined in Arizona; clinoptilolite was mined in California, Idaho, New Mexico, Oregon, and Texas. Domestic production of zeolites increased to 74,000 t in 2012 compared with 65,400 t in 2011. New Mexico was the leading producing State in 2012, followed by Texas, Idaho, California, Arizona, and Oregon.

Consumption

Sales of natural zeolites increased to 70,500 t in 2012 compared with 65,200 t in 2011. Domestic uses for natural zeolites were, in decreasing order by tonnage, animal feed, pet litter, cement, water purification, odor control, wastewater treatment, fungicide or pesticide carrier, gas absorbent (and air filtration), fertilizer carrier, oil absorbent, desiccant, catalyst, and aquaculture. Animal feed, cement, odor control, pet litter, water purification, and wastewater treatment, accounted for more than 70% of the domestic sales tonnage.

In 2012, sales of natural zeolites increased for animal feed, catalyst, cement, gas absorbent, pet litter, water purification, and wastewater treatment. Sales for aquaculture, desiccant, fertilizer carrier, fungicide or pesticide carrier, odor control, and oil absorbent decreased. The greatest increases in sales were, by tonnage, for animal feed and wastewater treatment. The greatest decline in sales was, by tonnage, for fertilizer carrier applications.

Prices

Prices for natural zeolites vary with zeolite content and processing. Unit values, obtained through the U.S. Geological Survey canvass of domestic zeolite producers, ranged from \$50 to \$800 per metric ton. The bulk of the tonnage was valued between \$90 and \$240 per ton.

Foreign Trade

Comprehensive trade data were not available for natural zeolites because they are included under a generic U.S. Census Bureau Harmonized Tariff Schedule (HTS) code 2530.90.8060 (mineral substances not elsewhere specified or included). In 2012, exports of natural zeolites (other than gem-quality specimens) were estimated to be between 500 t and 1,000 t. About 69 t of these exports can be documented with the shipments going to Denmark and India, in decreasing order by quantity (United Business Media Global Trade, undated). Unknown quantities of natural and synthetic zeolites were shipped to Japan by U.S. companies participating in the cleanup of nuclear contamination near Fukushima, Japan. Although some zeolites were shipped under the generic HTS code, others may have been shipped as part of an ion-absorption unit or labeled as ion-exchange media rather than as zeolite. Imports were estimated to be less than 5 t in 2012. Most of the U.S. zeolite import trade was in synthetic zeolite products.

World Review

Most countries do not report natural zeolite production. Therefore, data in this section are estimated unless otherwise noted.

World production of natural zeolites was in the range of 2.7 to 3.2 Mt in 2012 based on reported production by some countries, world market trends, and production estimates published in trade journals. World production probably remained unchanged in 2012 because of the continued economic uncertainties in countries where natural zeolites were sold in large volumes for construction uses.

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

China was the leading producer of natural zeolites (including zeolitic tuffs for pozzolanic cement applications). Production in China probably was in the range of 1.8 to 2.2 Mt. The second leading producer was the Republic of Korea with 230,000 t; followed by Turkey (excluding pozzolanic cement applications), 150,000 t; the United States, 74,000 t (reported); Cuba, 45,000 t; Jordan (excluding pozzolanic applications), 15,000 t; Mexico, 2,100 t; and Indonesia (excluding pozzolanic cement applications), 1,600 t. Countries that may produce zeolites but for which insufficient data were available to make reliable production estimates include Argentina, Armenia, Australia, Bulgaria, Canada, Georgia, Germany, Greece, Hungary, Iran, Italy, Japan, Mexico, New Zealand, the Philippines, Russia, Serbia, Slovakia, Slovenia, South Africa, Spain, and Ukraine.

Canada.—Canadian Mining Co. Inc. began drilling at its Sun Group zeolite project near Princeton, British Columbia. Samples from the drilling project may enable the company to determine the size and grade of the deposit and better determine end-use markets for the material (Canadian Mining Company Inc., 2012).

India.—Gujarat Mineral Development Corporation (GMDC) formed a joint venture with Credo Minerals Industries Ltd. to set up a zeolite grinding plant in the Kutch district. The plant is expected to have an annual capacity of 40,000 t when fully operational. GMDC planned to hold a 26% share in the project. The zeolite product would be targeted at the detergent market (Asia Miner, 2012).

Outlook

U.S. production of natural zeolites increased to 74,000 t in 2012 from 30,100 t in 1997 and U.S. sales increased to 70,500 t

in 2012 from 30,100 t in 1997. During this time, the quantity of zeolites sold for animal feed increased the most, followed by cement, water purification, odor control, fungicide or pesticide carrier, wastewater treatment, and gas absorbent applications. Desiccant, fertilizer, and pet litter applications declined between 1997 and 2012.

In 2012, production and sales of natural zeolites increased by 13% and 8%, respectively. Based on existing market conditions in the United States, growth in domestic production and sales may be similar in 2013. Worldwide, a significant portion of natural zeolite sales were linked to construction activities, where natural zeolites and (or) zeolitic tuffs were sold as dimension stone, lightweight aggregate, and pozzolanic cement. Because many countries continue to face economic uncertainties that could affect construction activities, world production and consumption were likely to remain unchanged in 2013.

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TABLE 1
SALIENT ZEOLITE STATISTICS¹

| | | 2008 | 2009 | 2010 | 2011 | 2012 |
|--------------------------------|---------------------|---------|---------|---------|-----------|-----------|
| United States: | | | | | | |
| Production | metric tons | 60,100 | 59,500 | 61,300 | 65,400 | 74,000 |
| Sales | do. | 58,500 | 59,400 | 60,000 | 65,200 | 70,500 |
| Exports ^c | do. | <200 | <500 | <400 | 700–1,500 | 500-1,000 |
| Imports ^c | do. | <200 | <200 | <150 | <150 | <5 |
| World, production ^c | million metric tons | 2.5–3.0 | 2.8–3.3 | 2.8–3.3 | 2.8–3.3 | 2.7–3.2 |

^cEstimated. do. Ditto.

¹Data are rounded to no more than three significant digits.

TABLE 2
DOMESTIC ZEOLITE PRODUCERS IN 2012

| State and company | Type of zeolite |
|-------------------------------------|-----------------|
| Arizona: | |
| St. Cloud Mining, Inc. ¹ | Chabazite. |
| UOP LLC | Do. |
| California: | |
| KMI Zeolite Inc. | Clinoptilolite. |
| St. Cloud Mining, Inc. ² | Do. |
| Steelhead Specialty Minerals, Inc. | Do. |
| Idaho, Bear River Zeolite Co., Inc. | Do. |
| New Mexico: | |
| Coyote Cliff, LLC | Do. |
| St. Cloud Mining, Inc. | Do. |
| Oregon, Teague Mineral Products Co. | Do. |
| Texas, Zeotech Corp. | Do. |
| Do. Ditto. | |

¹Formerly GSA Resources, Inc.

²Formerly Ash Meadows, LLC.