

ZEOLITES (NATURAL)

(Data in metric tons unless otherwise noted)

Domestic Production and Use: In 2018, six companies in the United States operated nine zeolite mines and produced an estimated 95,000 tons of natural zeolites, a 15% increase from that of 2017. Two mines operated by an additional company were idle during the year. Chabazite was mined in Arizona, and clinoptilolite was mined in California, Idaho, New Mexico, Oregon, and Texas. Minor quantities of ferrierrite, mordenite, and phillipsite were also likely produced. New Mexico was estimated to be the leading natural zeolite-producing State in 2018, followed by California, Idaho, Texas, Oregon, and Arizona. The top three U.S. companies accounted for approximately 90% of total domestic production.

An estimated 93,000 tons of natural zeolites were sold in the United States during 2018, an increase of 14% compared with sales in 2017. Domestic uses were, in decreasing order by estimated quantity, animal feed, odor control, water purification, oil and grease absorbent, unclassified end uses, fertilizer carrier, gas absorbent (and air filtration), pet litter, desiccant, wastewater treatment, soil amendment, traction control (ice melt), synthetic turf, aquaculture, and fungicide or pesticide carrier. Animal feed, odor control, and water purification applications likely accounted for about 75% of the domestic sales tonnage.

Salient Statistics—United States:	2014	2015	2016	2017	2018^e
Production, mine	62,800	75,100	75,200	82,400	95,000
Sales, mill	62,500	73,200	71,300	81,300	93,000
Imports for consumption ^e	<1,000	<1,000	<1,000	<1,000	<1,000
Exports ^e	<1,000	<1,000	<1,000	<1,000	<1,000
Consumption, apparent ^{e, 1}	62,500	73,200	71,300	81,300	93,000
Price, range of value, dollars per metric ton ²	110–440	110–950	100–400	100–300	100–300
Employment, mine and mill ^{e, 3}	95	100	115	110	110
Net import reliance ⁴ as a percentage of estimated consumption	E	E	E	E	E

Recycling: Zeolites used for desiccation, gas absorbance, wastewater cleanup, and water purification may be reused after reprocessing of the spent zeolites. Information about the quantity of recycled natural zeolites was unavailable.

Import Sources (2014–17): Comprehensive trade data were not available for natural zeolite minerals because they were imported and exported under a generic U.S. Census Bureau Harmonized Tariff Schedule code that includes multiple mineral commodities or under codes for finished products. Nearly all imports and exports consisted of synthetic zeolites.

Tariff: Item	Number	Normal Trade Relations 12–31–18
Mineral substances not elsewhere specified or included	2530.90.8050	Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Prior to the 1990s, annual output of natural zeolites in the United States was less than 15,000 tons. Production rose more than sixfold from 1990 through 2018 owing predominantly to increases in sales for animal feed applications, although sales for odor control and water purification also increased significantly. In contrast, sales for pet litter declined substantially during this period as a result of competition from other products.

According to Mine Safety and Health Administration records, one domestic natural zeolite mine halted operations in March 2018; information about whether or when mining would recommence was unavailable. A major U.S. company finished construction of a new processing plant in 2017. The annual capacity of the mill was upgraded to more than 35,000 tons, a tenfold increase in comparison to the former plant. In early 2018, the company began a project to further expand its production capacity.

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World Mine Production and Reserves: Most countries either do not report production of natural zeolites or production is reported with a 2- to 3-year lag time. End uses for natural zeolites in countries that mine large tonnages of zeolite minerals typically include low-value, high-volume construction applications, such as dimension stone, lightweight aggregate, and pozzolanic cement. As a result, production data for some countries do not accurately indicate the quantities of natural zeolites used in the high-value applications that are reflected in the domestic data.

World reserves of natural zeolites have not been estimated. Deposits occur in many countries, but companies rarely, if ever, publish reserves data. Further complicating estimates of reserves is the fact that much of the reported world production includes altered volcanic tuffs with low to moderate concentrations of zeolites that are typically used in high-volume construction applications. Some deposits should, therefore, be excluded from reserves estimates because it is the rock itself and not its zeolite content that makes the deposit valuable.

Production data for multiple countries were revised based on information from Government and industry sources.

	Mine production ^e		Reserves ⁵
	<u>2017</u>	<u>2018</u>	
United States	⁶ 82,400	95,000	World reserves data are unavailable but are estimated to be large.
China	300,000	300,000	
Cuba	⁶ 56,500	57,000	
Jordan	20,000	20,000	
Korea, Republic of	120,000	120,000	
New Zealand	⁶ 100,000	100,000	
Turkey	70,000	70,000	
Other countries	<u>350,000</u>	<u>350,000</u>	
World total (rounded)	1,100,000	1,100,000	

World Resources: Recent estimates for domestic and global resources of natural zeolites are not available. Resources of chabazite and clinoptilolite within the Basin and Range province in the United States are sufficient to satisfy foreseeable domestic demand.

Substitutes: For pet litter, zeolites compete with other mineral-based litters, such as those manufactured using bentonite, diatomite, fuller's earth, and sepiolite; organic litters made from shredded corn stalks and paper, straw, and wood shavings; and litters made using silica gel. Diatomite, perlite, pumice, vermiculite, and volcanic tuff compete with natural zeolite as lightweight aggregate. Zeolite desiccants compete against such products as magnesium perchlorate and silica gel. Zeolites compete with bentonite, gypsum, montmorillonite, peat, perlite, silica sand, and vermiculite in various soil amendment applications. Activated carbon, diatomite, or silica sand may substitute for zeolites in water-purification applications. As an oil absorbent, zeolites compete mainly with bentonite, diatomite, fuller's earth, sepiolite, and a variety of polymer and natural organic products. In animal feed, zeolites compete with bentonite, diatomite, fuller's earth, kaolin, silica, and talc as anticaking and flow-control agents.

^eEstimated. E Net exporter.

¹Defined as mill sales + imports – exports.

²Range of ex-works mine and mill unit values for individual natural zeolite operations, based on data reported by U.S. producers and U.S. Geological Survey estimates. Average unit values per metric ton for the past 5 years were \$150 in 2014 and 2015 and \$140 in 2016, 2017, and 2018. Prices vary with the percentage of zeolite present in the product, the chemical and physical properties of the zeolite mineral(s), particle size, surface modification and (or) activation, and end use.

³Excludes office staff.

⁴Defined as imports – exports.

⁵See Appendix C for resource and reserve definitions and information concerning data sources.

⁶Reported figure.