ZEOLITES (NATURAL)

(Data in metric tons unless otherwise noted)

Domestic Production and Use: In 2022, seven companies operated 10 zeolite mines in six States and produced an estimated 86,000 tons of natural zeolites. Total production increased slightly compared with production in 2021. Chabazite was mined in Arizona, and clinoptilolite was mined in California, Idaho, New Mexico, Oregon, and Texas. Small quantities of erionite, ferrierite, mordenite, and phillipsite were likely also produced. The three leading companies accounted for approximately 80% of total domestic production.

An estimated 79,000 tons of natural zeolites were sold in the United States during 2022, 6% more than the sales in 2021. Domestic uses were, in descending order of estimated quantity, animal feed, odor control, water purification, unspecified end uses (such as ice melt, soil amendment, and synthetic turf), pet litter, fertilizer carrier, wastewater treatment, air filtration and gas absorbent, oil and grease absorbent, fungicide or pesticide carrier, aquaculture, and desiccant. Animal feed, odor control, and water purification applications accounted for about 70% of the domestic sales tonnage.

Salient Statistics—United States:	2018	2019	2020	2021	2022[e]
Production, mine	86,100	87,800	86,700	85,300	86,000
Sales, mill	80,500	77,100	75,300	73,900	79,000
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[1]	80,500	77,100	75,300	74,000	79,000
Price, range of value, dollars per metric ton[e, 2]	50–300	50–300	50–300	50–300	50–300
Employment, mine and mill, number[e, 3]	110	120	120	120	120
Net import reliance[4] as a percentage of apparent 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 (2018–21): Comprehensive trade data were not available for natural zeolite minerals because they were imported and exported under a generic Harmonized Tariff Schedule of the United States code and Schedule B number, respectively, that include multiple mineral commodities or under codes for finished products. Nearly all imports and exports were thought to be synthetic zeolites.

Tariff: Item	Number	Normal Trade Relations 12–31–22
Mineral substances not elsewhere specified or included	2530.90.8050	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Production almost tripled from 1992 through 2022 owing to increased sales for animal feed, odor control, and water purification applications. Domestic natural zeolite production has remained steady in recent years. However, sales for natural zeolites have waned over the last few years in pet litter and wastewater cleanup applications as a result of competition from other products such as clays and synthetic zeolites. Reported sales of natural zeolites products for the use of synthetic turf, pool filter media, and traction control have become more common within the past 5 years. The increase in sales in 2022 was the result of the expansion of natural zeolites into other applications.

World Mine Production and Reserves: Many countries either do not report production of natural zeolites, report zeolites as part of a pooled group of mineral commodities often listed as “other,” or report production 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 may not be comparable to U.S. production data, which are the quantities of natural zeolites used in high-value applications.

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ZEOLITES (NATURAL)

World reserves of natural zeolites have not been estimated. Deposits occur in many countries, but companies rarely 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 these deposits valuable.

	Mine production[e]		Reserves[5]
	2021	2022	
United States	[6]85,300	86,000	Two of the leading companies in the United States reported combined reserves of 80 million tons in 2022; total U.S. reserves likely were substantially larger. World data were unavailable, but reserves were estimated to be large.
China	52,000	52,000	
Cuba	100,000	100,000	
Georgia	130,000	130,000	
Hungary	27,000	27,000	
Indonesia	130,000	130,000	
Jordan	12,000	12,000	
Korea, Republic of	130,000	130,000	
New Zealand	100,000	100,000	
Russia	35,000	35,000	
Slovakia	150,000	150,000	
Turkey	46,000	50,000	
Other countries	5,500	6,000	
World total (rounded)	1,000,000	1,000,000	

World Resources:[5] Recent estimates for domestic and global resources of natural zeolites are not available. Resources of chabazite and clinoptilolite 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 zeolites 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.

[e]Estimated. E Net exporter.

[1]Defined as mill sales + imports – exports. Information about industry stocks was unavailable.

[2]Range 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 an estimated $125 in 2018, 2019, 2020, and 2021 and $130 in 2022. 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.

[3]Excludes administration and office staff. Estimates based on data from the Mine Safety and Health Administration.

[4]Defined as imports – exports.

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

[6]Reported.