

## ZEOLITES (NATURAL)

(Data in metric tons unless otherwise specified)

**Domestic Production and Use:** In 2024, seven companies operated nine zeolite mines in six States and produced an estimated 81,000 tons of natural zeolites. Total production increased by 3% compared with production in 2023. 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 also likely produced.

An estimated 73,000 tons of natural zeolites were sold in the United States during 2024, 4% less than the sales in the previous year. Domestic uses were, in descending order of estimated quantity, animal feed, odor control, unspecified end uses (such as ice melt, soil amendment, and synthetic turf), water purification, wastewater treatment, gas absorbent, fertilizer carrier, pet litter, oil and grease absorbent, fungicide or pesticide carrier, desiccant, aquaculture, and catalyst. Animal feed and odor control accounted for 46% and 12%, respectively, of the domestic sales tonnage.

**Salient Statistics—United States:**

	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023<sup>e</sup></b>	<b>2024<sup>e</sup></b>
Production, mine	86,700	87,000	77,400	78,000	81,000
Sales, mill	75,300	73,900	79,800	76,000	73,000
Imports for consumption <sup>e</sup>	<1,000	<1,000	<1,000	<1,000	<1,000
Exports <sup>e</sup>	<1,000	<1,000	<1,000	<1,000	<1,000
Consumption, apparent <sup>1</sup>	75,300	73,900	79,800	76,000	73,000
Price, range of value, dollars per metric ton <sup>e, 2</sup>	50–300	50–300	50–300	50–300	50–300
Employment, mine and mill, number <sup>e, 3</sup>	120	120	130	130	130
Net import reliance <sup>4</sup> as a percentage of apparent consumption	E	E	E	E	E

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

**Import Sources (2021–24):** 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 estimated to be synthetic zeolites.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–24</b>
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 and sales of natural zeolites have more than doubled from 1993 through 2024 owing to increased sales for animal feed, odor control, soil amendment, and water purification applications. Domestic production and sales of natural zeolite products have fluctuated in recent years. Natural zeolite sales decreased for the second year in a row after reaching a 5-year high in 2022. Sales for natural zeolites have fluctuated over the past few years owing to a shift in zeolite markets and competition from other products such as clays and synthetic zeolites. The change from traditional sales markets such as pet litter to newer markets (traction control, soil amendment, and artificial turf infill) has generated more variance in production and sales volumes.

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**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 time delay. 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.

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 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		Reserves <sup>5</sup>
	2023	2024 <sup>e</sup>	
United States	e78,000	81,000	Two of the leading companies in the United States reported combined reserves of 80 million metric tons in 2022; total U.S. reserves likely were substantially larger. World data were unavailable, but reserves were estimated to be large.
Chile	500	500	
China	e150,000	150,000	
Cuba	e78,000	78,000	
Georgia	3,600	5,000	
Hungary	e32,000	35,000	
Indonesia	e120,000	120,000	
Jordan	e1,000	1,000	
Korea, Republic of	178,000	130,000	
New Zealand	e100,000	100,000	
Philippines	3,260	7,100	
Russia	e35,000	35,000	
Slovakia	207,000	220,000	
Turkey	71,700	70,000	
World total (rounded)	1,060,000	1,000,000	

**World Resources:**<sup>5</sup> 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.

<sup>e</sup>Estimated. E Net exporter.

<sup>1</sup>Defined as mill sales + imports – exports. Information about industry stocks was unavailable.

<sup>2</sup>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 2020 and 2021; \$167 in 2022; \$127 in 2023, and \$145 in 2024. 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.

<sup>3</sup>Excludes administration and office staff. Estimates based on data from the Mine Safety and Health Administration.

<sup>4</sup>Defined as imports – exports.

<sup>5</sup>See Appendix C for resource and reserve definitions and information concerning data sources.