(Data in metric tons, bromine content, unless otherwise specified)

Domestic Production and Use: Bromine was recovered from underground brines by two companies in Arkansas. Bromine is one of the leading mineral commodities, in terms of value, produced in Arkansas. The two bromine companies in the United States account for a large percentage of world production capacity.

The leading global applications of bromine are for the production of brominated flame retardants (BFRs) and clear brine drilling fluids. Bromine compounds are also used in a variety of other applications, including industrial uses, as intermediates, and for water treatment. U.S. apparent consumption of bromine in 2023 was estimated to be less than that in 2022.

Salient Statistics—United States:	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u> e
Production	W	W	W	W	W
Imports for consumption, elemental bromine and compounds ¹	56,300	30,700	27,200	36,500	51,000
Exports, elemental bromine and compounds ²	29,300	36,600	27,900	19,400	34,000
Consumption, apparent ³	W	W	W	W	W
Price, average unit value of imports (cost, insurance, and freight),	2.31	2.67	2.85	3.29	3.10
dollars per kilogram, bromine content					
Employment, number ^e	1,050	1,050	1,050	1,050	1,050
Net import reliance ⁴ as a percentage of apparent consumption	<25	E	E	<25	<25

Recycling: Some bromide solutions were recycled to obtain elemental bromine and to prevent the solutions from being disposed of as hazardous waste. For example, hydrogen bromide is emitted as a byproduct of many organic reactions; this byproduct can be recycled with virgin bromine brines and used as a source of bromine production. Bromine contained in plastics, such as BFRs, can be difficult and costly to remove because the BFR is often bound to the polymer or resin matrix; therefore, bromine will often be recycled via the parent polymer with the polymer used again in new products. Bromine used in zinc-bromine batteries can be removed and completely recovered as bromine at the battery's end of life, purified, and used for new batteries. Available information was insufficient to estimate the quantity of bromine recovered and recycled.

Import Sources (2019–22):⁵ Israel, 82%; Jordan, 10%; China,⁶ 4%; and other, 4%.

<u>Tariff</u> : Item	Number	Normal Trade Relations 12–31–23
Bromine	2801.30.2000	5.5% ad valorem.
Hydrobromic acid	2811.19.3000	Free.
Potassium or sodium bromide	2827.51.0000	Free.
Ammonium, calcium, or zinc bromide	2827.59.2500	Free.
Potassium bromate	2829.90.0500	Free.
Sodium bromate	2829.90.2500	Free.
Methyl bromide ⁷	2903.61.0000	Free.
Ethylene dibromide ⁸	2903.62.1000	5.4% ad valorem.
Dibromoneopentylglycol	2905.59.3000	Free.
Tetrabromobisphenol A	2908.19.2500	5.5% ad valorem.
Decabromodiphenyl and octabromodiphenyl oxide	2909.30.0700	5.5% ad valorem.

Depletion Allowance: Brine wells, 5% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The United States maintained its position as one of the leading bromine producers in the world along with China, Israel, and Jordan. In 2023, estimated total imports of bromine and bromine compounds (bromine content) increased by more than 30% from those in 2022, and the leading source of imports of bromine and bromine compounds (gross weight) was Israel (83%), followed by Jordan (14%). The average annual import unit value of bromine and bromine compounds (contained weight) was approximately \$3.10 per kilogram, which was about 5% less than that in 2022. Together, the leading imported bromine products in terms of both gross weight and bromine content were bromides and bromide oxides of ammonium, calcium, or zinc and bromides of sodium or potassium, accounting for over 90% of total imported bromine. These compounds are used in a variety of applications, with clear brine drilling fluids likely being the leading consuming end-use application.

BROMINE

In 2023, estimated total exports (bromine content) increased by more than 70% compared with those in 2022, and the leading destinations for exports (gross weight) were Guyana (28%), Saudi Arabia (19%), and Brazil (18%). The average annual export unit value of bromine and bromine compounds (contained weight) was approximately \$3.60 per kilogram, which was slightly more than the \$3.54 per kilogram in 2022.

Globally, bromine selling prices were lower in 2023 compared with those in 2022. Bromine consumption was expected to be less in 2023 compared with that in 2022 owing to weak demand for BFRs from the construction and electronics industries. Sales of clear brine drilling fluids, the second leading use of bromine, were expected to remain strong in 2023. In the first half of 2023, the average number of worldwide active drilling rigs increased compared with the annual average count in 2022.

World Production and Reserves: Reserves for China were revised based on Government reports.

	Production ^e		Reserves ⁹
	2022	2023	
United States	W	W	11,000,000
Azerbaijan		_	300,000
China	73,000	76,000	130,000
India	3,500	3,500	NA
Israel	¹⁰ 178,000	170,000	Large
Japan	20,000	20,000	ŇĂ
Jordan	115,000	120,000	Large
Ukraine	10,800	11,000	ŇĂ
World total (rounded)	¹¹ 400,000	¹¹ 400,000	Large

World Resources:⁹ Bromine is found principally in seawater, evaporitic (salt) lakes, and underground brines associated with petroleum deposits. The Dead Sea, in the Middle East, is estimated to contain 1 billion tons of bromine. Seawater contains about 65 parts per million bromine, or an estimated 100 trillion tons. Bromine is also recovered from seawater as a coproduct during evaporation to produce salt.

<u>Substitutes</u>: Chlorine and iodine may be substituted for bromine in a few chemical reactions and for sanitation purposes. There are no comparable substitutes for bromine in various oil- and gas-well-completion and packer applications. Because plastics have a low ignition temperature, aluminum hydroxide, magnesium hydroxide, organic chlorine compounds, and phosphorus compounds can be substituted for bromine as fire retardants in some uses.

estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. - Zero.

¹Includes data for the Harmonized Tariff Schedule of the United States codes shown in the "Tariff" section.

²Includes data for the following Schedule B numbers: 2801.30.2000, 2827.51.0000, and 2827.59.0000 (2019–23); 2903.31.0000 and 2903.39.1520 (2019–21); and 2903.61.0000 and 2903.62.1000 (2022–23).

³Defined as production (sold or used) + imports – exports.

⁴Defined as imports – exports.

⁵Calculated using the gross weight of imports.

⁶Includes Hong Kong.

⁷Prior to 2022, was listed under Harmonized Tariff Schedule of the United States code 2903.39.1520.

⁸Prior to 2022, was listed under Harmonized Tariff Schedule of the United States code 2903.31.0000.

⁹See Appendix C for resource and reserve definitions and information concerning data sources.

¹⁰Reported.

¹¹Excludes U.S. production.