BROMINE

(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 also are used in a variety of other applications, including industrial uses, as intermediates, and for water treatment. U.S. apparent consumption of bromine in 2024 was estimated to be more than that in 2023.

Salient Statistics—United States:	2020	2021	2022	2023	2024[e]
Production	W	W	W	W	W
Imports for consumption, elemental bromine and compounds[1]	30,700	27,200	36,500	50,800	61,000
Exports, elemental bromine and compounds[2]	36,600	27,900	19,400	38,900	34,000
Consumption, apparent[3]	W	W	W	W	W
Price, average unit value of imports (cost, insurance, and freight), dollars per kilogram, bromine content	2.67	2.85	3.29	2.92	2.70
Employment, number[e]	1,100	1,100	1,100	1,100	1,100
Net import reliance[4] as a percentage of apparent consumption	E	E	<25	<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 several 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. The stability of BFRs may reduce or eliminate the need for incorporating additional flame retardants into new products made from recycled plastic because the recycled plastic may meet the same levels of fire safety as the virgin material. However, this stability may lead to the unintentional reintroduction of bromine or BFRs into new plastic product cycles. 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 (2020–23):[5] Israel, 83%; Jordan, 9%; China,[6] 3%; and other, 5%.

Tariff: 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 2024, estimated total imports of bromine and bromine compounds (bromine content) increased by 20% from those in 2023, and the leading source of imports of bromine and bromide compounds (gross weight) through July 2024 was Israel (87%), followed by Jordan (10%). The average annual unit value of imported bromine and bromine compounds (bromine content) was approximately $2.70 per kilogram, which was 8% less than that in 2023. 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 more than 90% of total imported bromine.

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BROMINE

In 2024, estimated total exports (bromine content) decreased by 13% compared with those in 2023, and the leading destinations for exports (gross weight) through July 2024 were Guyana (29%), Saudi Arabia (25%), and the United Kingdom (14%). The average annual unit value of exported bromine and bromine compounds (bromine content) was approximately $3.30 per kilogram, compared with $3.28 per kilogram in 2023.

In July 2024, the U.S. Food and Drug Administration (FDA) revoked the authorization for brominated vegetable oil (BVO) to be used as a food additive. BVO had been used to stabilize fruit flavoring oils in fruit-flavored beverages since the 1920s. It was classified as generally recognized as safe (GRAS) by the FDA until 1970 when it lost its GRAS classification owing to toxicity concerns. Based on available information at the time, the FDA approved its continued use at a maximum level of 15 parts per million in beverages compared with the previous maximum level of 150 parts per million. A more recent collaborative study demonstrated that a safe level of dietary BVO could not be established; therefore, there was no longer a reasonable certainty of no harm from the use of BVO as a stabilizer in flavoring oils.[9]

World Production and Reserves: Reserves for Jordan were revised based on company reports.

	Production[e]		Reserves[10]
	2023	2024	
United States	W	W	11,000,000
China	[11]101,000	100,000	130,000
India	6,900	7,000	NA
Israel	[11]143,000	140,000	Large
Japan	20,000	20,000	NA
Jordan	[11]116,000	120,000	360,000
Ukraine	8,000	8,000	NA
World total (rounded)	[12]395,000	[12]400,000	Large

World Resources:[10] Bromine is found principally in seawater, evaporitic (salt) lakes, and underground brines associated with petroleum deposits. Seawater contains about 65 parts per million bromine, or an estimated 100 trillion tons. The Dead Sea, in the Middle East, is estimated to contain 1 billion tons of bromine. Bromine also is recovered from seawater as a coproduct during evaporation to produce salt.

Substitutes: 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.

[e]Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data.

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

[2]Includes data for the following Schedule B numbers: 2801.30.2000, 2827.51.0000, and 2827.59.0000 (for the years 2020–24); 2903.31.0000 and 2903.39.1520 (for the years 2020–21); and 2903.61.0000 and 2903.62.1000 (for the years 2022–24).

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

[4]Defined as imports – exports.

[5]Calculated using the gross weight of imports.

[6]Includes Hong Kong.

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

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

[9]Source: U.S. Food and Drug Administration, 2024, Revocation of authorization for use of brominated vegetable oil in food: Federal Register, v. 89, no. 128, July 3, p. 55040–55045. (Accessed September 25, 2024, at https://www.govinfo.gov/content/pkg/FR-2024-07-03/pdf/2024-14300.pdf.)

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

[11]Reported.

[12]Excludes U.S. production.