BROMINE

(Data in metric tons of contained bromine unless otherwise noted)

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 2022 was estimated to be greater than that in 2021.

Salient Statistics—United States:	2018	2019	2020	2021	2022[e]
Production	W	W	W	W	W
Imports for consumption, elemental bromine and compounds[1]	56,200	56,300	30,700	27,200	27,000
Exports, elemental bromine and compounds[2]	21,900	29,300	36,600	27,900	18,000
Consumption, apparent[3]	W	W	W	W	W
Price, average unit value of imports (cost, insurance, and freight), dollars per kilogram	2.21	2.31	2.67	2.85	3.5
Employment, number[e]	1,050	1,050	1,050	1,050	1,050
Net import reliance[4] as a percentage of apparent consumption	<25	<25	E	E	<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; therefore, bromine-containing polymers will often be recycled with the virgin polymer and 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 (2018–21):[5] Israel, 80%; Jordan, 12%; China,[6] 4%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12–31–22
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 2022, the leading source of imports of bromine and bromide compounds (gross weight) was Israel. The average import value of bromine and bromine compounds was estimated to have increased by over 20% in 2022 compared with that in 2021. 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 (over 90%). Estimated total imports of bromine and bromine compounds (bromine content) decreased slightly, whereas estimated total exports decreased by over 30% compared with those in 2021.

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BROMINE

In 2021, the U.S. Environmental Protection Agency issued a final rule to reduce the exposure to decabromodiphenyl ether (decaBDE), a BFR considered to be persistent, bioaccumulative, and toxic. The rule prohibited the manufacture, processing, distribution, or importing of decaBDE or products containing decaBDE. The importing, manufacturing, and processing of decaBDE and products to which decaBDE had been added was prohibited effective March 2021, and distribution prohibitions started in January 2022. Longer compliance dates or exclusions were set for certain uses such as aerospace vehicle parts, hospitality curtains, and wire and cable insulation used in nuclear power facilities. Because of health concerns, some States have established their own policies restricting the use of BFRs.

Globally, bromine selling prices were higher in 2022 compared with those in 2021. Domestic sale volumes of bromine and bromine compounds also increased in 2022 compared with those in 2021 owing primarily to sales of BFRs. BFR sales were driven by strong demand for appliance, automotive, construction, and electronic industries. Sales of clear brine drilling fluids, the second leading use of bromine, also increased compared with those of the previous year.

World Production and Reserves:

	Production[e]		Reserves[9]
	2021	2022	
United States	W	W	11,000,000
Azerbaijan	—	—	300,000
China	70,000	70,000	NA
India	5,000	5,000	NA
Israel	[10]182,000	180,000	Large
Japan	18,000	20,000	NA
Jordan	110,000	110,000	Large
Ukraine	4,500	4,500	NA
World total (rounded)	[11]390,000	[11]390,000	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.

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. — Zero.

[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, 2827.59.0000, 2903.31.0000, and 2903.39.1520 (for the years 2018–2021), and 2903.61.0000 and 2903.62.1000 (for the year 2022).

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

[10]Reported.

[11]Excludes U.S. production.