

# BROMINE

(Data in metric tons of bromine content 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 and intermediates and industrial uses. Bromine compounds are also used in a variety of other applications, including drilling fluids and industrial water treatment. U.S. apparent consumption of bromine in 2020 was estimated to be less than that in 2019.

<b>Salient Statistics—United States:</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020<sup>e</sup></b>
Production	W	W	W	W	W
Imports for consumption, elemental bromine and compounds <sup>1</sup>	58,400	52,700	56,200	56,300	43,000
Exports, elemental bromine and compounds <sup>2</sup>	28,300	32,600	21,900	29,300	35,000
Consumption, apparent <sup>3</sup>	W	W	W	W	W
Price, average value of imports (cost, insurance, and freight), dollars per kilogram	2.19	2.30	2.21	2.31	2.40
Employment, number <sup>e</sup>	1,050	1,050	1,050	1,050	1,050
Net import reliance <sup>4</sup> as a percentage of apparent consumption	<25	<25	<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 in many organic reactions. This byproduct waste can be recycled with virgin bromine brines and used as a source of bromine production. Bromine contained in plastics can be incinerated as solid organic waste, and the bromine can be recovered.

**Import Sources (2016–19):**<sup>5</sup> Israel, 80%; Jordan, 11%; China, 6%; and other, 3%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–20</b>
	Bromine	2801.30.2000	5.5% ad val.
	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.
	Ethylene dibromide	2903.31.0000	5.4% ad val.
	Methyl bromide	2903.39.1520	Free.
	Dibromoneopentyl glycol	2905.59.3000	Free.
	Tetrabromobisphenol A	2908.19.2500	5.5% ad val.
	Decabromodiphenyl and octabromodiphenyl oxide	2909.30.0700	5.5% ad val.

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

**Government Stockpile:** None.

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**Events, Trends, and Issues:** The United States maintained its position as one of the leading bromine producers in the world. China, Israel, and Jordan also are major producers of elemental bromine. In 2020, U.S. net imports of bromine and bromine compounds decreased compared with those in 2019. The average import value of bromine and bromine compounds increased by about 4% in 2020 compared with that in 2019. The leading source of imports of bromine and bromide compounds (gross weight) in 2020 was Israel. 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 (about 90%). Reported exports of methyl bromide were revised for 2017 through 2019 by the U.S. Census Bureau.

Global consumption of bromine and bromine compounds decreased in 2020. Owing to the global COVID-19 pandemic, the demand for flame retardants and clear brine fluids, leading applications for bromine and bromine compounds, decreased. This decreased demand was attributed to declining consumer spending in the automotive, electronic, and construction industries (which use brominated flame retardants in their products), as well declining demand for drilling fluids by the oil- and gas-well-drilling industries, which use clear brine fluids in oil- and gas-well drilling. Although the values of U.S.-imported bromine and bromine compounds increased in 2020 compared with those in 2019, domestic selling prices were reported to have decreased slightly.

Some bromine facilities in Shandong Province, China, restarted production in the first half of 2020 following completion of rectifications and improvements required to meet new environmental regulations initiated by the Government of China in late 2017. However, production volumes and selling prices remained low.

### World Production and Reserves:

	Production		Reserves <sup>6</sup>
	<u>2019</u>	<u>2020<sup>e</sup></u>	
United States	W	W	11,000,000
Azerbaijan	—	—	300,000
China	64,000	63,000	NA
India	10,000	10,000	NA
Israel	180,000	180,000	Large
Japan	20,000	20,000	NA
Jordan	150,000	150,000	Large
Ukraine	4,500	4,500	NA
World total (rounded)	<u>7429,000</u>	<u>7430,000</u>	<u>Large</u>

**World Resources:**<sup>6</sup> 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.

<sup>e</sup>Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

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

<sup>2</sup>Includes data for the following Schedule B codes: 2801.30.2000, 2827.51.0000, 2827.59.0000, 2903.31.0000, and 2903.39.1520.

<sup>3</sup>Defined as production (sold or used) + imports – exports.

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

<sup>5</sup>Calculated using the gross weight of imports.

<sup>6</sup>See Appendix C for resource and reserve definitions and information concerning data sources.

<sup>7</sup>Excludes U.S. production.