

## 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 often is the leading mineral commodity, 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, intermediates and industrial uses, drilling fluids, and water treatment, in descending order by quantity. Bromine compounds are also used in a variety of other applications, including the control of mercury emissions from coal-fired powerplants and in specialty rubbers, particularly for tire manufacturing.

<b>Salient Statistics—United States:</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017<sup>e</sup></b>
Production	W	W	W	W	W
Imports for consumption, elemental bromine and compounds <sup>1</sup>	36,300	57,600	58,000	58,400	55,000
Exports, elemental bromine and compounds <sup>2</sup>	18,200	20,600	25,000	25,200	31,400
Consumption, apparent <sup>3</sup>	W	W	W	W	W
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	<50	<50	<50	<50	<50

**Recycling:** Some bromide solutions were recycled to obtain elemental bromine and to prevent the solutions from being disposed of as hazardous waste. 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. Almost 50% of production came from recycled or byproduct bromides at one U.S. producer. Bromine contained in plastics can be incinerated as solid organic waste, and the bromine can be recovered.

**Import Sources (2013–16):**<sup>5</sup> Israel, 84%; China, 7%; Jordan, 5%; and other, 4%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–17</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 2017, U.S. imports of bromine and bromine compounds decreased, and exports increased.

U.S. companies did not announce prices for bromine and bromine compounds in 2017. Trade publications, however, reported that U.S. bromine prices ranged from about \$4,400 to \$5,400 per metric ton during the year, essentially unchanged compared with 2016 prices. Global demand for brominated flame retardants continued to be strong in 2017. However, demand for clear brine fluids used in the oil-well- and gas-well-drilling industries remained weak in 2017 owing to low oil prices.

The use of bromine to mitigate mercury emissions continued to be an area of growth for the bromine industry owing to the finalized rules set by the U.S. Environmental Protection Agency's Mercury and Air Toxics Standards, which require coal- and oil-fired powerplants to limit their emissions of air pollutants such as mercury and arsenic. Bromine compounds bond with mercury in flue gases from coal-fired powerplants creating mercuric bromide, a substance that is more easily captured in flue-gas scrubbers than the mercuric chloride that is produced at many facilities.

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

	Production		Reserves <sup>6</sup>
	2016	2017 <sup>e</sup>	
United States	W	W	11,000,000
Azerbaijan	—	—	300,000
China	57,600	60,000	NA
India	1,700	1,700	NA
Israel	162,000	162,000	NA
Japan	20,000	20,000	NA
Jordan	100,000	100,000	NA
Turkmenistan	500	500	700,000
Ukraine	3,500	3,500	NA
World total (rounded)	<sup>7</sup> 345,000	<sup>7</sup> 350,000	Large

**World Resources:** 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 of 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-well 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>Imports calculated from items shown in Tariff section.

<sup>2</sup>Exports calculated from Schedule B numbers 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.