

BROMINE

(Data in thousand metric tons of bromine content unless otherwise noted)

Domestic Production and Use: The quantity of bromine sold or used in the United States from three companies operating in Arkansas and Michigan accounted for 100% of elemental bromine production. Arkansas, with six plants, led the Nation in bromine production, and bromine was the leading mineral commodity in terms of value produced in the State. In Michigan, bromine was produced as a byproduct of magnesium compounds production. Three bromine companies in the United States accounted for more than one-third of world production.

A major domestic company reported that bromine is used in the manufacture of dyes, fire retardants, insect repellents, oilfield completion fluids, perfumes, pharmaceuticals, photographic chemicals, water-treatment chemicals, and other chemicals. Other products included intermediate chemicals for the manufacture of products and bromide solutions used alone or in combination with other chemicals.

Salient Statistics—United States:	2002	2003	2004	2005	2006^e
Production ¹	222	216	222	226	226
Imports for consumption, elemental bromine and compounds ²	7	7	10	10	10
Exports, elemental bromine and compounds	13	13	8	11	11
Consumption, apparent ³	216	210	220	225	225
Price, cents per kilogram, bulk, purified bromine	74.7	71.7	86.0	74.3	74.2
Employment, number	1,700	1,700	1,500	1,200	1,200
Net import reliance ⁴ as a percentage of apparent consumption	—	E	E	E	E

Recycling: Some bromide solutions were recycled to obtain elemental bromine and prevent the solutions from being disposed of as hazardous waste. This recycled bromine is not included in the virgin bromine production reported by the companies, but is included in data collected by the U.S. Census Bureau.

Import Sources (2002-05): Israel, 93%; United Kingdom, 2%; Indonesia, 1%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12-31-06
Ammonium, calcium, or zinc bromide	2827.59.2500	Free.
Bromides and bromide oxides	2827.59.5000	3.6% ad val.
Bromine	2801.30.2000	5.5% ad val.
Bromochloromethane	2903.49.1000	Free.
Decabromodiphenyl and octabromodiphenyl oxide	2909.30.0700	5.5% ad val.
Ethylene dibromide	2903.30.0500	5.4% ad val.
Hydrobromic acid	2811.19.3000	Free.
Potassium bromate	2829.90.0500	Free.
Potassium or sodium bromide	2827.51.0000	Free.
Sodium bromate	2829.90.2500	Free.
Tetrabromobisphenol A	2908.10.2500	5.5% ad val.
Vinyl bromide, methyl bromide	2903.30.1520	Free.

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

Government Stockpile: None.

Events, Trends, and Issues: Israel and the United States were the leading producers of bromine in the world. Approximately 90% of Israel's production was for export, accounting for about 80% of international trade in bromine and bromine compounds to more than 100 countries. Exports from Israel were used to produce bromine compounds at a plant in the Netherlands for export to other countries.

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Tetra Technologies Inc. announced plans to invest \$100 million in a project to produce bromine from brine. The plant will process bromine, calcium chloride, and sodium chloride from brine reserves around Magnolia, AR. The bromine produced would replace bromine now being imported and would have negligible effect on current producers.⁵

A silver bromide bacteria coating would give biomedical implants bacteria-fighting capabilities. By adding a silver salt to a copolymer silver bromide, particles are captured by the polymer. Because silver bromide is sparingly soluble, there is no uncontrolled dissolution of silver. The coatings can kill gram-positive and gram-negative bacteria on surfaces and in solution.⁶

Price increases for many bromine compounds were announced reflecting the rising market value of the bromine and to cover major increases in the costs of energy, raw materials, regulatory compliance, and transportation.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ⁷	Reserve base ⁷
	2005	2006 ^e		
United States ¹	226	226	11,000	11,000
Azerbaijan	2	2	300	300
China	43	44	130	3,500
France	2	2	1,600	1,600
Germany	0.5	0.5	(8)	(8)
India	1.5	1.5	(9)	(9)
Israel	210	210	(10)	(10)
Italy	0.3	0.3	(9)	(9)
Japan	20	20	(11)	(11)
Jordan	46	46	(10)	(10)
Spain	0.1	0.1	1,400	1,400
Turkmenistan	0.15	0.15	700	700
Ukraine	3	3	400	400
World total (rounded)	555	556	Large	Large

World Resources: Resources of bromine are virtually unlimited. 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 and gas well completion and packer applications that do not harm the permeability of the production zone and that control well "blowouts." Because plastics have a low ignition temperature, alumina, magnesium hydroxide, organic chlorine compounds, and phosphorous compounds can be substituted for bromine as fire retardants in some uses. Bromine compounds and bromine acting as a synergist with other materials are used as fire retardants in plastics, such as those found in electronics.

^eEstimated. E Net exporter. — Zero.

¹Sold or used by U.S. producers.

²Imports calculated from items shown in Tariff section.

³Includes recycled product.

⁴Defined as imports – exports + adjustments for Government and industry stock changes.

⁵Chemical & Engineering News, 2006, Tetra slates bromine output: Chemical & Engineering News, v. 84, no. 9, February 27, p. 20.

⁶Halford, Bethany, 2006, Silver bromide bacteria fighter: Chemical & Engineering News, v. 84, no. 29, July 27, p. 8.

⁷[See Appendix C for definitions.](#)

⁸From waste bitters associated with potash production.

⁹From waste bitters associated with solar salt.

¹⁰From the Dead Sea.

¹¹From seawater.