

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, which was valued at an estimated \$191 million. 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 production. Three bromine companies in the United States accounted for 38% of world production.

A major domestic producer of bromine and bromine compounds voluntarily ceased production of pentapolybrominated diphenyl ether and octapolybrominated diphenyl ether (PBDEs) at yearend 2004 after traces were detected in samples of human blood and breast milk; these two PBDEs were widely used flame-retardant chemicals that will be replaced with Firemaster 550, which is not persistent, does not bioaccumulate, and is not ecotoxic.

A major domestic company reported bromine is used in the manufacture of pharmaceuticals, fire retardants, water-treatment chemicals, insect repellents, photographic chemicals, perfumes, dyes, oilfield completion fluids 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:	2000	2001	2002	2003	2004^e
Production ¹	228	212	222	216	222
Imports for consumption, elemental bromine and compounds ²	20	16	7	7	10
Exports, elemental bromine and compounds	10	11	13	13	8
Consumption, apparent ³	238	214	216	210	220
Price, cents per kilogram, bulk, purified bromine	90.0	67.0	99.2	72.0	70
Employment, number	1,700	1,700	1,700	1,700	1,500
Net import reliance ⁴ as a percentage of apparent consumption	4	—	—	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 (2000-03): Israel, 90%; United Kingdom, 4%; Indonesia, 2%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12-31-04
Bromine	2801.30.2000	5.5% ad val.
Bromides and bromide oxides	2827.59.5000	3.6% ad val.
Bromochloromethane	2903.49.1000	Free.
Ammonium, calcium, or zinc bromide	2827.59.2500	Free.
Decabromodiphenyl and octabromodiphenyl oxide	2909.30.0700	5.5% ad val.
Ethylene dibromide	2903.30.0500	5.5% 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, methylene dibromide	2903.30.1520	Free.

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

Government Stockpile: None.

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Events, Trends, and Issues: Israel ranked second behind the United States in world bromine production. 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.

A major domestic producer of bromine and bromine compounds was creating three technology centers that included bromine and bromination technology to help in emerging scientific fields. The centers are expected to add a long-range dimension to new product development capability and expand its technology acquisition capability. The company acquired the bromine fine chemicals business of a French producer located at Port-de-Bouc.

Under the Montreal Protocol, the United States, along with other developed countries, phased out the use of methyl bromide in 2005 as a crop pesticide, except for those uses that were exempted. Imports of crops grown and treated with methyl bromide in Mexico are expected to continue; however, because Mexico is classified as a developing country, it is not required to phase out methyl bromide use until 2015. As the United States phases out production, imports of methyl bromide from undeveloped countries have increased.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ⁵	Reserve base ⁵
	2003	2004 ^e		
United States ¹	216	222	11,000	11,000
Azerbaijan	2	2	300	300
China	42	42	130	3,500
France	2	2	1,600	1,600
Germany	0.5	0.5	(6)	(6)
India	1.5	1.5	(7)	(7)
Israel	206	206	(8)	(8)
Italy	0.3	0.3	(7)	(7)
Japan	20	20	(9)	(9)
Jordan	20	50	(8)	(8)
Spain	0.1	0.1	1,400	1,400
Turkmenistan	0.15	0.15	700	700
Ukraine	3	3	400	400
United Kingdom	35	35	(7)	(7)
World total (rounded)	550	590	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 that has been evaporated to produce salt. The bromine content of underground water in Poland has been estimated to be 36 million tons.

Substitutes: Chlorine and iodine may be substituted for bromine in a few chemical reactions and for sanitation purposes. Aniline and some of its derivatives, methanol, ethanol, and gasoline-grade tertiary butyl alcohol, are effective nonleaded substitutes for ethylene dibromide and lead in gasoline for cars. Farm equipment and airplanes still used leaded as an octane booster in fuels that require ethylene dibromide as a "scavenger" to remove the lead after the gasoline is burned. 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.

⁵See Appendix C for definitions.

⁶From waste biterms associated with potash production.

⁷From waste biterms associated with solar salt.

⁸From the Dead Sea.

⁹From seawater.