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 four companies operating in Arkansas and Michigan accounted for 100% of elemental bromine production valued at an estimated $150 million. Arkansas continued to be the Nation's leading bromine producer, and bromine was the leading mineral commodity in terms of value produced in the State.

Estimated bromine use was fire retardants, 27%; agriculture, 15%; petroleum additives, 15%; well drilling fluids, 10%; sanitary preparations, 5%; and other uses, 28%. Other uses included intermediate chemicals used in the manufacture of other products and bromide solutions used alone or in combination with other chemicals.

Salient Statistics—United States:	**1992**	**1993**	**1994**	**1995**	**1996[e]**
Production[1]	171	177	195	218	227
Imports for consumption, elemental bromine and compounds[2]	15	19	24	12	12
Exports, elemental bromine andcompounds	22	19	18	14	14
Consumption, apparent[3]	157	267	197	306	315
Price, cents per kilogram, bulk, purified bromine	73.3	69.5	79.5	85.3	66.1
Stocks, producer, yearend, elemental bromine[e]	—	—	—	—	—
Employment, number	1,200	1,600	1,600	1,600	1,700
Net import reliance[4] as a percent of apparent consumption	—	—	—	E	E

Recycling: Approximately 35% of U.S. bromine production was converted to byproduct sodium bromide solutions, which were recycled to obtain elemental bromine. This recycled bromine is not included in the virgin bromine production reported by the companies.

Import Sources (1992-95): Israel, 83%; Netherlands, 9%; France, 5%; and other, 3%.

Tariff: Item	**Number**	**Most favored nation (MFN) 12/31/96**	**Non-MFN[5] 12/31/96**
Bromine	2801.30.2000	6.6% ad val.	37% ad val.
Bromochloromethane	2903.49.1000	Free	25% ad val.
Ammonium, calcium, or zinc bromide	2827.59.2500	Free	25% ad val.
Decabromodiphenyl and octabromodiphenyl oxide	2909.30.0700	17.1% ad val.	15.4¢/kg + 70.5% ad val.
Ethylene dibromide	2903.30.0500	5.4% ad val.	46.3% ad val.
Hydrobromic acid	2811.19.3000	2.5% ad val.	25% ad val.
Potassium bromate	2829.90.0500	1.9% ad val.	25% ad val.
Potassium or sodium bromide	2827.51.0000	Free	22¢/kg.
Methyl bromide	2903.30.1520	Free	25% ad val.
Sodium bromate	2829.90.2500	2.2% ad val.	25% ad val.
Tetrabromobisphenol A	2908.10.2500	1.2¢/kg + 16.6% ad val.	15.4¢/kg + 62% ad val.

Depletion Allowance: 5% on brine wells (Domestic and Foreign).

Government Stockpile: None.

Events, Trends, and Issues: Two bromine companies completed plans to expand domestic capacity. A third company was building a bromine plant with capacity between 9 and 14 million kilograms at Manistee, MI. The plant will produce elemental bromine and brominated salts from brines used to produce magnesium hydroxide. The plant is expected to be operational in late 1997.

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BROMINE

The U.S. Environmental Protection Agency planned to work on an essential-use exemption for methyl bromide in the that event effective alternatives are not found by 2001. Methyl bromide was listed as a Class I ozone depleting substance in the 1990 Clean Air Act and is scheduled to be phased out in 2001. In 1996 a study by the U.S. Department of Agriculture, found that methyl iodide may be a replacement in most uses.

Israel is the second largest producer of bromine in the world. Bromine was produced from brines after production of potash and magnesium.

A study on using bromine in gold processing reported higher results for bromine than for cyanide when using activated carbon.

During 1996, a supplier of brines in Arkansas sued a bromine company that processed bromine from the brines for higher royalty payments. Bromine is produced from brines that were leased from various owners of mineral rights. Payments to the mineral rights owners is based on the value of the first product, that is, bromine. The basis for the suit was to base the royalty payments on the value of flame retardants manufactured from the bromine. The suit was settled. The bromine producers in Arkansas will be able to continue producing bromine using the unitization method if the company has 75% of the mining rights to the brine in the area.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves[6]	Reserve base[6]
	1995	1996[e]		
United States[1]	218	227	11,000	11,000
Azerbaijan	2.0	2.0	300	300
China	19	19	NA	NA
France	2.0	2.0	1,600	1,600
India	1.5	1.5	([7])	([7])
Israel	135.0	135.0	([8])	([8])
Italy	.3	.3	([7])	([7])
Japan	15.0	15.0	([9])	([9])
Spain	.2	.2	1,400	1,400
Turkmenistan	7.0	7.0	700	700
Ukraine	3.5	4.0	400	400
United Kingdom	28.0	28.0	([7])	([7])
World total (rounded)	430.0	440.0	NA	NA

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. The bromine content of underground water in Poland has been estimated at 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 nonlead substitutes for ethylene dibromide and lead in gasoline in some cars. There are no comparable substitutes for bromine in various oil and gas well completion and packer applications. Alumina, magnesium hydroxide, organic chlorine compounds, and phosphorus compounds can be substituted for bromine as fire retardants in some uses.

[e]Estimated. NA Not available. E Net exporter.

[1]Sold or used by U.S. producers.

[2]Imports calculated from items shown in tariff section.

[3]Includes recycled product beginning in 1993.

[4]Defined as imports - exports + adjustments for Government and industry stock changes.

[5]See Appendix B.

[6]See Appendix C for definitions.

[7]From waste bitterns associated with solar salt. See World Resources section.

[8]From the Dead Sea. See World Resources section.

[9]From seawater. See World Resources section.