

## BROMINE

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

**Domestic Production and Use:** The quantity of bromine sold or used in the United States from companies operating in Arkansas and Michigan accounted for 100% of elemental bromine production valued at an estimated \$186 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 combinations with other chemicals.

<b>Salient Statistics—United States:</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995<sup>e</sup></b>
Production <sup>1</sup>	170	171	177	195	211
Imports for consumption, elemental bromine and compounds <sup>2</sup>	24	15	19	20	20
Exports, elemental bromine and compounds	17	22	19	20	25
Consumption, apparent <sup>3</sup>	169	157	267	197	206
Price, cents per kilogram, bulk, purified bromine	73.2	73.3	69.5	70.0	88.0
Stocks, producer, yearend, elemental bromine <sup>e</sup>	—	—	—	—	—
Employment, plant	1,200	1,600	1,600	1,600	1,700
Net import reliance <sup>4</sup> as a percent of apparent consumption	—	—	—	—	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 (1991-94):** Israel, 76%; Netherlands, 20%; and France, 4%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Most favored nation (MFN) 12/31/95</b>	<b>Non-MFN<sup>5</sup> 12/31/95</b>
	Bromine	2801.30.2000	7% ad val.	37% ad val.
	Ammonium, calcium, or zinc bromide	2827.59.2500	Free	25% ad val.
	Decabromodiphenyl and octabromodiphenyl oxide	2909.30.0700	18.6% 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	3.4% ad val.	25% ad val.
	Potassium bromate	2829.90.0500	2.5% 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	3.0% ad val.	25% ad val.
	Tetrabromobisphenol A	2908.10.2500	1.4¢/kg + 18% 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 announced plans to expand domestic capacity. One of the companies announced that their bromine production capacity would be increased 30% at its plant in Magnolia, AR. A third company planned to build a bromine plant with capacity between 9 and 14 million kilograms at Manistee, MI. The plant would produce elemental bromine and brominated salts from brines used to produce magnesium. The plant was expected to be completed in late 1996.

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The Environmental Protection Agency planned to work on an essential-use exemption for methyl bromide in the 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.

Producers of brominated flame retardants have voluntarily agreed to phase out production of some grades of flame retardants considered capable of emitting toxic byproducts when incinerated. The agreement was reached by a joint policy board on chemical safety at the Paris-based Organization for Economic Cooperation and Development (OECD).

Israel, the second largest producer of bromine in the world, canceled the public offering of a 22% share in the state-owned chemical company. The delay in privatization was as a result of the offering not meeting the Government's minimum price.

Israel and Jordan announced a memorandum of understanding to construct a \$50 million bromine plant on the Jordanian side of the Dead Sea. The 50-50 joint venture would be managed by the Jordanians, but technical and marketing assistance would be provided by Dead Sea Bromine. The facility would have a capacity of 11 million kilograms per year of bromine. Dead Sea signed an agreement with a domestic producer to provide bromine during a 20-year period.

### World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves <sup>6</sup>	Reserve base <sup>6</sup>
	1994	1995 <sup>e</sup>		
United States <sup>1</sup>	195.0	211.0	11,000	11,000
Azerbaijan	3.0	3.0	300	300
China	19.0	19.0	NA	NA
France	2.5	2.5	1,600	1,600
Germany	.8	.8	36	36
India	1.4	1.4	(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	8.0	8.0	700	700
Ukraine	4.0	4.0	400	400
United Kingdom	<u>28.0</u>	<u>28.0</u>	<u>(7)</u>	<u>(7)</u>
World total (rounded)	410.0	430.0	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.

<sup>e</sup>Estimated. E Net exporter. NA Not available.

<sup>1</sup>Sold or used by U.S. producers.

<sup>2</sup>Imports calculated from items shown in tariff section.

<sup>3</sup>Includes recycled product beginning in 1993.

<sup>4</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

<sup>5</sup>See Appendix B.

<sup>6</sup>See Appendix C for definitions.

<sup>7</sup>From waste bitterns associated with solar salt.

<sup>8</sup>From the Dead Sea.

<sup>9</sup>From seawater.