

## 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, which was valued at an estimated \$185 million. Arkansas, with six plants, continued to be the Nation's leading bromine producer, and bromine was the leading mineral commodity in terms of value produced in the State.

Three bromine companies accounted for 64% of world production. Two of these companies are located in the United States and accounted for about 94% of U.S. production.

The Surface Transportation Board proposed new merging and consolidation regulations for railroads, which are important carriers for bromine shippers. The chemical industry, which includes bromine, is the second largest customer of railroads. The industry had competitive, financial, and service concerns regarding the proposed regulations.

Bromine was used in fire retardants (40%), drilling fluids (24%), brominated pesticides (12%), water-treatment chemicals (7%), and other products, including photographic chemicals and rubber additives (17%). Other products included intermediate chemicals for the manufacture of products and bromide solutions used alone or in combination with other chemicals.

<b>Salient Statistics—United States:</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001<sup>e</sup></b>
Production <sup>1</sup>	247	230	239	228	204
Imports for consumption, elemental bromine and compounds <sup>2</sup>	11	10	10	20	20
Exports, elemental bromine and compounds	14	12	10	10	10
Consumption, apparent <sup>3</sup>	244	235	238	238	214
Price, cents per kilogram, bulk, purified bromine	80.2	70.0	87.0	90.0	67.0
Employment, number	1,700	1,700	1,700	1,700	1,700
Net import reliance <sup>4</sup> as a percentage of apparent consumption	E	—	E	4	5

**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 (1997-2000):** Israel, 89%; United Kingdom, 6%; Belgium, 2%; Netherlands, 2%; and other, 1%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations</b>
			<b>12/31/01</b>
	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	9.8% 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	0.4¢/kg + 9.7% 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:** A U.S. company's subsidiary signed a joint-venture agreement with a Jordanian company to build a bromine complex at Safi, Jordan. Construction, which began in 2000 and was expected to be completed by 2002, included a 50,000-ton-per-year bromine plant. Downturns in the economy, especially in electrical products such as computers and telecommunication equipment, led to a reduction in the demand for brominated fire retardants. Fire retardants accounted for approximately 40% of all plastic additives consumed in North America. Brominated fire retardants are competitive in terms of cost and performance in these electrical applications.

A French company began investing about \$12.8 million in a speciality brominated derivatives plant in Port-de-Bouc, France. The bromine will be supplied from the company's Port-de-Bouc plant that produces 12,000 tons per year of elemental bromine. Production is destined for the pharmaceutical industry.

Israel was the second largest producer of bromine in the world and the largest producer of elemental bromine. Approximately 90% of production was for export, accounting for about 80% of international trade in bromine and bromine compounds to more than 100 countries. The purchase of the remaining public shareholding of three subsidiaries, including bromine operations, was completed by the major chemical company in Israel. Exports are used to produce bromine compounds at a plant in the Netherlands.

Under the Montreal Protocol, the global phase out of methyl bromide as a crop pesticide will occur during 2001-05 in the United States. Imports of crops grown and treated with methyl bromide in Mexico are expected to continue, however, because Mexico is not required to phase out methyl bromide until 2015.

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

	Mine production		Reserves <sup>5</sup>	Reserve base <sup>5</sup>
	2000	2001 <sup>e</sup>		
United States <sup>1</sup>	228	204	11,000	11,000
Azerbaijan	2.0	2.0	300	300
China	45.0	45.0	NA	NA
France	2.0	2.0	1,600	1,600
India	1.5	1.5	(6)	(6)
Israel	185	200	(7)	(7)
Italy	0.3	0.3	(6)	(6)
Japan	20.0	20.0	(8)	(8)
Spain	0.1	0.1	1,400	1,400
Turkmenistan	0.15	0.15	700	700
Ukraine	3.0	3.0	400	400
United Kingdom	55.0	35.0	(6)	(6)
World total (rounded)	542	513	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 non lead 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 phosphorous compounds can be substituted for bromine as fire retardants in some uses.

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

<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.

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

<sup>5</sup>See Appendix C for definitions.

<sup>6</sup>From waste bitterns associated with solar salt.

<sup>7</sup>From the Dead Sea. See World Resources section.

<sup>8</sup>From seawater. See World Resources section.