## **BROMINE**

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

<u>Domestic Production and Use</u>: 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 \$155 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.

Primarily 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.

Salient Statistics—United States:	<u> 1999</u>	<u>2000</u>	<u> 2001</u>	<u> 2002</u>	2003 <sup>e</sup>
Production <sup>1</sup>	239	228	212	222	216
Imports for consumption, elemental					
bromine and compounds <sup>2</sup>	10	20	16	7	7
Exports, elemental bromine and compounds	10	10	11	13	12
Consumption, apparent <sup>3</sup>	238	238	214	216	211
Price, cents per kilogram, bulk, purified bromine	87.0	90.0	67.0	99.2	72.0
Employment, number	1,700	1,700	1,700	1,700	1,700
Net import reliance⁴ as a percentage					
of apparent consumption	E	4			Е

**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.

Import Sources (1999-2002): Israel, 88%; United Kingdom, 4%; China, 1%; Indonesia, 1%; Netherlands, 1%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12/31/03
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	7.0% 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	0.2¢/kg + 6.9% ad val.
Vinyl bromide, methylene dibromide	2903.30.1520	Free.

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

Government Stockpile: None.

## BROMINE

**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.

Jordan officially inaugurated a new bromine producer on June 23, 2003. The new firm is a joint venture between two companies located in Jordan and the United States. The \$123 million venture started operations in November 2002 and reportedly has 10% of the world market. About 80 Jordanians were employed in the plant. The production was targeted to markets in Europe and the Far East.

Negotiations were in final discussions for a U.S. company to acquire the bromine fine chemicals business of a French producer located at Port-de-Bouc.

Under the Montreal Protocol, the U.S. phase of the global elimination of methyl bromide as a crop pesticide will begin during 2001-5 for those uses not exempted. 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 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		Mine production Reserves <sup>5</sup>	
	2002	2003 <sup>e</sup>		
United States <sup>1</sup>	222	216	11,000	11,000
Azerbaijan	2	2	300	300
China	42.0	42	130	3,500
France	2	2	1,600	1,600
Germany	0.5	0.5	( <sup>6</sup> )	( <sup>6</sup> )
India	1.5	1.5	$\binom{7}{2}$	$\binom{7}{2}$
Israel	206	206	(8)	(8)
Italy	0.3	0.3	$\binom{7}{2}$	$\binom{7}{2}$
Japan	5	25	(9)	$\binom{9}{2}$
Jordan	5	20	(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	<u>50</u>	<u>50</u>	(')	(')
World total (rounded)	540	570	Large	Large

<u>World Resources</u>: 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.

<u>Substitutes</u>: 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. Alumina, magnesium hydroxide, organic chlorine compounds, and phosphorous compounds can be substituted for bromine as fire retardants in some uses.

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

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

<sup>&</sup>lt;sup>2</sup>Imports calculated from items shown in Tariff section.

<sup>&</sup>lt;sup>3</sup>Includes recycled product.

<sup>&</sup>lt;sup>4</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>&</sup>lt;sup>5</sup>See Appendix C for definitions.

<sup>&</sup>lt;sup>6</sup>From waste bitterns associated with potash production.

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

<sup>&</sup>lt;sup>8</sup>From the Dead Sea. See World Resources section.

<sup>&</sup>lt;sup>9</sup>From seawater. See World Resources section.