

## BORON

(Data in thousand metric tons of boric oxide (B<sub>2</sub>O<sub>3</sub>), unless noted)

**Domestic Production and Use:** The estimated value of boric oxide contained in minerals and compounds produced in 1995 was \$462 million. Domestic production of boron minerals primarily as sodium borates, by four companies was centered in southern California. The largest producer operated an open pit tincal and kernite mine and associated compound plants. A second firm, using Searles Lake brines as raw material at two plants, accounted for the remaining output. A third company continued to process small amounts of calcium and calcium sodium borates. A fourth company began an in-situ process at midyear. Principal consuming firms were in the North Central and Eastern States. The reported end-use distribution pattern for boron compounds consumed in the United States in 1994 was glass products, 56%; agriculture, 7%; fire retardants, 6%; soaps and detergents, 5%; and other, 26%.

<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>	626	554	574	550	602
Imports for consumption, gross weight:					
Borax	4	6	14	14	14
Boric acid	3	3	10	18	18
Colemanite	8	12	36	40	40
Ulexite	6	17	60	60	60
Exports, gross weight of boric acid and refined borates	601	569	555	550	230
Consumption: Apparent	346	308	356	373	287
Reported	262	345	321	296	NA
Price, dollars per ton, granulated pentahydrate borax in bulk, c.l., works <sup>2</sup>	247	250	304	294	294
Stocks, yearend <sup>3</sup>	NA	NA	NA	NA	NA
Employment	1,100	900	900	900	900
Net import reliance <sup>4</sup> as a percent of apparent consumption	E	E	E	E	E

**Recycling:** Insignificant.

**Import Sources (1991-94):** Boric acid: Italy, 57%; Chile, 31%; and other, 12%.

<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>
Borates:				
Refined borax:				
	Anhydrous	2840.11.0000	0.07¢/kg	0.28¢/kg.
	Other	2840.19.0000	0.07¢/kg	0.28¢/kg.
	Other	2840.20.0000	3.7% ad val.	25% ad val.
Perborates:				
	Sodium	2840.30.0010	3.7% ad val.	25% ad val.
	Other	2840.30.0050	3.7% ad val.	25% ad val.
Boric acids				
		2810.00.0000	1.5% ad val.	8.5% ad val.
Natural borates:				
	Calcium	2528.90.0010	Free	Free.
	Sodium	2528.10.0000	Free	Free.
	Other	2528.90.0050	Free	Free.

**Depletion Allowance:** Borax 14% (Domestic), 14% (Foreign).

**Government Stockpile:** None.

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**Events, Trends, and Issues:** The United States was the world's largest producer of boron compounds during 1995 and exported about one-half of domestic production. Exported materials competed with borax, boric acid, colemanite, and ulexite primarily from Turkey, the second largest producer of boron compounds and the largest producer of ore in the world.

Imports of borates from northern Chile continued. About 150,000 tons per year of ulexite is mined in Chile for the production of boric acid; synthetic colemanite; and ulexite for use in ceramics, insulating and reinforcing fiberglass, and agriculture. Shipments are from the Port of Arica.

U.S. companies were improving their process to lessen environmental effects, improve worker safety, and increase efficiency of the operations. In situ production of colemanite began in May using a patented process. Wells are used to pump solution from deposits between 360 and 540 meters under the surface. The boron rich solution is processed to produce a high-purity colemanite. Another company was using a remote haulage vehicle that allows the haulage operator to remain in a safer area of the mine and therefore lessens the chance of an accident due to a roof fall. The lake operations continued to implement improvements that will allow increased production. The process injects heated water from another operation into the upper-mixed layer and recycles the water to produce borax. The largest producing company approved plans to recycle pond waste through dryers and then magnetic separators to reclaim borax. The reclaimed borax would be processed as a supplement to mined ore, thus increasing production efficiency while improving the environment.

### **World Production, Reserves, and Reserve Base:<sup>6</sup>**

	Production—all forms		Reserves <sup>7</sup>	Reserve base <sup>7</sup>
	1994	1995 <sup>e</sup>		
United States	1,110	1,110	40,000	80,000
Argentina	140	140	2,000	9,000
Bolivia	10	10	4,000	19,000
Chile	110	110	8,000	41,000
China	120	120	27,000	36,000
Iran	1	1	1,000	1,000
Kazakstan	80	80	14,000	15,000
Peru	27	30	4,000	22,000
Russia	190	190	40,000	44,000
Turkey	<u>1,250</u>	<u>1,250</u>	<u>30,000</u>	<u>150,000</u>
World total (may be rounded)	3,000	3,000	170,000	420,000

**World Resources:** Large domestic resources of boron materials occur in California, chiefly in sediments and their contained brines. Extensive resources also occur in Turkey. World resources are adequate to supply demand at current rates for the foreseeable future.

**Substitutes:** Substitution for boron materials is possible in applications such as soaps, detergents, enamel, and insulation. In soaps, sodium and potassium salts of fatty acids are the usual cleaning and emulsion agents. Borates in detergents can be replaced by the use of chlorine bleach and other enzymes. Some enamels use other glass producing substances, such as phosphates. Insulation substitutes include foams and mineral wools.

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

<sup>1</sup>Minerals and compounds sold or used by producers; includes both actual mine production and marketable products.

<sup>2</sup>Chemical Marketing Reporter.

<sup>3</sup>Stocks data are not available and are assumed to be zero for net import reliance and apparent consumption calculations.

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

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

<sup>6</sup>Gross weight of ore in thousand metric tons.

<sup>7</sup>See Appendix C for definitions.