

## BORON

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

**Domestic Production and Use:** Data for boron production and consumption in 2008 in the United States were withheld to avoid disclosure of individual company proprietary data. Boron minerals, primarily as sodium borates, were produced domestically by two companies in southern California. The leading producer operated an open pit tinal and kernite mine and associated compound plants. A second company produced borax and boric acid using saline brines as the raw material. A third company that previously processed calcium and calcium sodium borates became a trader and sold from inventory and imported products in 2005 but continues to be idle in 2008. Boron minerals and chemicals were principally consumed in the North Central and the Eastern United States. The estimated distribution pattern for boron compounds consumed in the United States in 2008 was glass and ceramics, 74%; soaps, detergents, and bleaches, 6%; agriculture, 3%; enamels and glazes, 3%; and other, 14%.

<b>Salient Statistics—United States:</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008<sup>e</sup></b>
Production <sup>1</sup>	637	612	W	W	W
Imports for consumption, gross weight:					
Borax	(2)	1	2	1	1
Boric acid	49	52	85	67	65
Colemanite	21	31	25	26	27
Ulexite	110	103	131	92	90
Exports, gross weight:					
Boric acid	61	183	221	248	260
Colemanite	18	—	—	—	—
Refined sodium borates	135	308	393	446	470
Consumption:					
Apparent	509	439	W	W	W
Reported	385	W	W	W	W
Price, dollars per ton, granular pentahydrate borax <sup>3</sup>	577-673	587-685	587-685	599-699	599-699
Employment, number	1,390	1,360	1,320	1,350	1,420
Net import reliance <sup>4</sup> as a percentage of apparent consumption	E	E	E	E	E

**Recycling:** Insignificant.

**Import Sources (2004-07):** Boric acid: Turkey, 55%; Chile, 24%; Bolivia, 8%; Peru, 5%; and other, 8%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations</b>
			<b>12-31-08</b>
Natural borates:			
	Sodium	2528.10.0000	Free.
	Calcium	2528.90.0010	Free.
	Other	2528.90.0050	Free.
	Boric acids	2810.00.0000	1.5% ad val.
Borates:			
Refined borax:			
	Anhydrous	2840.11.0000	0.3% ad val.
	Other	2840.19.0000	0.1% ad val.
	Other	2840.20.0000	3.7% ad val.
Perborates:			
	Sodium	2840.30.0010	3.7% ad val.
	Other	2840.30.0050	3.7% ad val.

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

**Government Stockpile:** None.

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**Events, Trends, and Issues:** Although production data were withheld, the United States was a major world producer of refined boron compounds during 2008. U.S. processed products had fewer impurities and were produced with lower emissions than in other countries. The U.S. industry continues to produce boron minerals with a higher productivity per worker hour than those produced in other countries.

Growth in fiberglass and borosilicate production has driven a global demand for boron. A rapid increase in the manufacture of reinforcement-grade fiberglass in Asia, with subsequent increase in demand for borates, offset the development of boron-free reinforcement-grade fiberglass in Europe and the United States. The continued rise in energy prices can be expected to lead to greater use of insulation-grade fiberglass, with consequent growth in the use of boron.

Exported U.S. borate materials competed with borax, boric acid, colemanite, and ulexite, primarily from Turkey, the leading producer of boron ore in the world. China, Eastern Europe, and India are favorable areas for increased borates consumption because of their growing economies. Turkey launched a promotional campaign by seeking out new areas of use for the mineral. Significant strides in foreign investment, free trade, industrialization, and urbanization would continue to increase the demand for borates over the next several years.

### **World Production, Reserves, and Reserve Base:**<sup>5</sup>

	Production—All forms		Reserves <sup>6</sup>	Reserve base <sup>6</sup>
	2007	2008 <sup>e</sup>		
United States	W	W	40,000	80,000
Argentina	550	670	2,000	9,000
Bolivia	50	65	NA	NA
Chile	528	540	NA	NA
China	145	150	25,000	47,000
Iran	2	2	1,000	1,000
Kazakhstan	30	30	NA	NA
Peru	10	10	4,000	22,000
Russia	400	400	40,000	100,000
Turkey	<u>2,130</u>	<u>2,250</u>	<u>60,000</u>	<u>150,000</u>
World total (rounded)	3,840	4,100	170,000	410,000

**World Resources:** Large domestic reserves of boron materials occur in California, chiefly in sediments and their contained brines. Extensive resources also occur in Turkey. Small deposits are being mined in South America. At current levels of consumption, world resources are adequate for the foreseeable future.

**Substitutes:** Substitution for boron materials is possible in such applications 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 chlorine bleach or enzymes. Some enamels can use other glass-producing substances, such as phosphates. Insulation substitutes include cellulose, foams, and mineral wools.

<sup>e</sup>Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

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

<sup>2</sup>Less than ½ unit.

<sup>3</sup>Source: Industrial Minerals, no. 446, December 2004, p. 71; no. 459, December 2005, p. 70; no. 471, December 2006, p. 74; no. 483, December 2007, p. 76. In Mineral Commodity Summaries 2008 and earlier, price of granulated pentahydrate borax in bulk, carload, works was used.

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

<sup>5</sup>Gross weight of ore in thousand metric tons.

<sup>6</sup>[See Appendix C for definitions.](#)