

BORON

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: Two companies in southern California produced borates in 2013, and most of the boron products consumed in the United States were manufactured domestically. To avoid disclosing company proprietary data, U.S. boron production and consumption were withheld. The leading boron producer mined borate ores containing kernite, tincal, and ulexite by open pit methods and operated associated compound plants. The kernite was used for boric acid production and the tincal was used as a feedstock for sodium borate production. A second company produced borates from brines extracted through solution mining techniques. Boron minerals and chemicals were principally consumed in the North Central and the Eastern United States. In 2013, the glass and ceramics industries remained the leading domestic users of boron products, consuming an estimated 80% of total borates consumption. Boron also was used as a component in abrasives, cleaning products, insecticides, and in the production of semiconductors.

Salient Statistics—United States:	2009	2010	2011	2012	2013^e
Production	W	W	W	W	W
Imports for consumption, gross weight:					
Borax	(1)	(1)	2	2	2
Boric acid	36	50	57	55	60
Colemanite	31	50	20	28	30
Ulexite	28	1	5	12	10
Exports, gross weight:					
Boric acid	171	264	235	190	190
Refined sodium borates	417	423	492	456	460
Consumption:					
Apparent	W	W	W	W	W
Reported	W	W	W	W	W
Price, average value of mineral imports at port of exportation, dollars per ton	540	485	579	569	570
Employment, number	1,310	1,220	1,180	1,180	1,190
Net import reliance ² as a percentage of apparent consumption	E	E	E	E	E

Recycling: Insignificant.

Import Sources (2009–12): Borates: Turkey, 78%; China, 4%; Argentina, 3%; Austria, 3%; and other, 12%.

Tariff:	Item	Number	Normal Trade Relations 12–31–13
Natural borates:			
	Sodium	2528.00.0005	Free.
	Calcium	2528.00.0010	Free.
	Other	2528.00.0050	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: Elemental boron is a metalloid that has limited commercial applications. Although the term “boron” is commonly referenced, it does not occur in nature in an elemental state. Boron combines with oxygen and other elements to form boric acid, or inorganic salts called borates. Boron compounds, chiefly borates, are commercially important; therefore, boron products were priced and sold based on their boric oxide content (B_2O_3), varying by ore and compound and by the absence or presence of calcium and sodium. The four borate minerals—colemanite, kernite, tincal, and ulexite—make up 90% of the borate minerals used by industry worldwide. Although borates were used in more than 300 applications, more than three-quarters of the world’s supply is consumed in ceramics, detergents, fertilizer, and glass.

Consumption of borates is expected to increase in 2013 and the coming years, spurred by demand in the Asian and South American agricultural, ceramic, and glass markets. World consumption of borates was projected to reach 2.0 million tons of B_2O_3 by 2014, compared with 1.5 million tons of B_2O_3 in 2010. Demand for borates was expected to shift slightly away from detergents and soaps toward glass and ceramics.

Because China has low-grade boron reserves and demand for boron is anticipated to rise in that country, Chinese imports from Chile, Russia, Turkey, and the United States were expected to increase during the next several years. European and emerging markets were requiring more stringent building standards with respect to heat conservation. Consequently, increased consumption of borates for fiberglass insulation was expected. Continued investment in new refineries and technologies and the continued rise in demand were expected to fuel growth in world production during the next several years.

World Production and Reserves:

	Production—All forms ³		Reserves ⁴
	2012	2013 ^e	
United States	W	W	40,000
Argentina	650	700	2,000
Bolivia	130	130	NA
Chile	444	450	35,000
China	160	160	32,000
Kazakhstan	30	30	NA
Peru	104	200	4,000
Russia	400	250	40,000
Turkey	2,500	3,000	60,000
World total (rounded)	⁵ 4,420	⁵ 4,900	210,000

World Resources: Deposits of borates are associated with volcanic activity and arid climates, with the largest economically viable deposits located in the Mojave Desert of the United States, the Alpidic belt in southern Asia, and the Andean belt of South America. U.S. deposits consist primarily of tincal, kernite, and borates contained in brines, and to a lesser extent ulexite and colemanite. About 70% of all Turkish deposits are colemanite. Small deposits are being mined in South America. At current levels of consumption, world resources are adequate for the foreseeable future.

Substitutes: The substitution of other materials for boron is possible in detergents, enamel, insulation, and soaps. Sodium percarbonate can replace borates in detergents and requires lower temperatures to undergo hydrolysis, which is an environmental consideration. Some enamels can use other glass-producing substances, such as phosphates. Insulation substitutes include cellulose, foams, and mineral wools. In soaps, sodium and potassium salts of fatty acids can act as cleaning and emulsifying agents.

^eEstimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data.

¹Less than ½ unit.

²Defined as imports – exports.

³Gross weight of ore in thousand metric tons.

⁴[See Appendix C for resource/reserve definitions and information concerning data sources.](#)

⁵Excludes U.S. production.