

BORON

(Data in thousand metric tons of boric oxide (B₂O₃) unless otherwise noted)

Domestic Production and Use: Two companies in southern California produced borates in 2011, 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 in 2011 were withheld. The leading boron producer mined borate ores containing kernite and tincal 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. The estimated distribution pattern for boron compounds consumed in the United States in 2011 was glass and ceramics, 80%; soaps, detergents, and bleaches, 4%; agriculture, 4%; enamels and glazes, 3%; and other, 9%.

Salient Statistics—United States:	2007	2008	2009	2010	2011^e
Production ¹	W	W	W	W	W
Imports for consumption, gross weight:					
Borax	1	1	(2)	(2)	(2)
Boric acid	67	50	36	50	55
Colemanite	26	30	31	50	45
Ulexite	92	75	28	1	15
Exports, gross weight:					
Boric acid	248	303	171	264	250
Refined sodium borates	446	519	417	423	510
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	302	302	339	361	300
Employment, number	1,320	1,310	1,220	1,180	1,200
Net import reliance ³ as a percentage of apparent consumption	E	E	E	E	E

Recycling: Insignificant.

Import Sources (2007–10): Boric acid: Turkey, 62%; Chile, 10%; Bolivia, 5%; and other, 23%.

Tariff:	Item	Number	Normal Trade Relations 12-31-11
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: Elemental boron is a metalloid that has limited commercial applications. 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 borates—colemanite, kernite, tincal, and ulexite—make up 90% of the borates used by industry worldwide. Although there are more than 300 end uses for borates, more than three-quarters of the world's supply is sold into the following four end uses: ceramics, detergents, fertilizer, and glass.

The global economic crisis of late 2008 and recession of 2009 negatively affected sectors vital for boron consumption, such as the construction and automotive industries. The moderate economic recovery in 2010 created steady growth in boron production and consumption. Consumption of borates is expected to increase in 2011 and the coming years, spurred by strong demand in the Asian and South American agricultural, ceramic, and glass markets. In particular, boron consumption in the global fiberglass industry was projected to increase by 7% annually through 2013, spurred by a projected 19% increase in Chinese consumption. World consumption of borates was projected to reach 2.0 million metric tons of B_2O_3 by 2014, compared with 1.5 million metric tons of B_2O_3 in 2010. Demand for borates was expected to shift slightly away from detergents and soaps towards 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 forms⁴		Reserves⁵
	2010	2011^e	
United States	W	W	40,000
Argentina	600	630	2,000
Bolivia	97	120	NA
Chile	504	480	35,000
China	150	150	32,000
Iran	2	2	1,000
Kazakhstan	30	30	NA
Peru	293	370	4,000
Russia	400	400	40,000
Turkey	2,000	2,100	60,000
World total (rounded)	⁶ 4,080	⁶ 4,300	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.

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

²Less than ½ unit.

³Defined as imports – exports + adjustments for Government and industry stock changes.

⁴Gross weight of ore in thousand metric tons.

⁵See Appendix C for resource/reserve definitions and information concerning data sources.

⁶Excludes U.S. production.