

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

Domestic Production and Use: The estimated value of boric oxide contained in minerals and compounds produced in 2003 was \$275 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. The majority of the remaining output was produced using saline brines as raw material. A third company continued to process small amounts of calcium and calcium sodium borates, and a fourth company used an in situ process to produce synthetic colemanite. Principal consumption of boron minerals and chemicals was in the production of ceramics by firms in the North Central United States and the Eastern United States. The reported distribution pattern for boron compounds consumed in the United States in 2001 was as follows: glass and ceramics, 78%; soaps and detergents, 6%; agriculture, 4%; fire retardants, 3%; and other, 9%.

Salient Statistics—United States:	1999	2000	2001	2002	2003^e
Production ¹	618	546	536	518	536
Imports for consumption, gross weight:					
Borax	8	1	1	(²)	16
Boric acid	30	39	56	49	45
Colemanite	42	26	35	32	14
Ulexite	178	127	109	125	99
Exports, gross weight:					
Boric acid	107	119	85	84	79
Colemanite	NA	NA	NA	5	23
Refined sodium borates	370	413	221	150	142
Consumption:					
Apparent	534	356	482	492	488
Reported	416	360	347	359	NA
Price, dollars per ton, granulated pentahydrate borax in bulk, carload, works ³	376	376	376	376	400-425
Stocks, yearend ⁴	NA	NA	NA	NA	NA
Employment, number	900	1,300	1,300	1,300	1,300
Net import reliance ⁵ as a percentage of apparent consumption	E	E	E	E	E

Recycling: Insignificant.

Import Sources (1999-2002): Boric acid: Turkey, 43%; Chile, 22%; Canada, 14%; Bolivia, 7%; and other, 14%.

Tariff:	Item	Number	Normal Trade Relations 12/31/03
	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.
	Boric acids	2810.00.0000	1.5% ad val.
	Natural borates:		
	Sodium	2528.10.0000	Free.
	Other:		
	Calcium	2528.90.0010	Free.
	Other	2528.90.0050	Free.

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

Government Stockpile: None.

BORON

Events, Trends, and Issues: The United States was the world's largest producer of refined boron compounds during 2003, and about one-half of domestic production was exported. The largest company produced and processed ore from an open pit mine in California. A second company produced boron, sodium carbonate, and sodium sulfate from brines. The second company continued with plans to sell its boron assets. At the beginning of 2003, the third company suspended operations at its in situ operation. The fourth company that operated an underground mine in California continued to process the ore in Nevada for overseas export. U.S. processed products had fewer impurities, lower emissions, and higher productivity per worker hour worked than boron minerals produced in other countries.

It was reported that a leading indicator for demand for refined borates was a strong housing market. Domestic market sectors for boron minerals and chemicals are fiberglass, 69%; soaps and detergents, 6%; borosilicate glass, 5%; agriculture, 4%; frits and ceramics, 4%; cellulose insulation, 3%; and other uses, 9%.

The second largest company in the United States also produced specialty borates in Tuscany, Italy, where production was curtailed in 2002 because of a lack of colemanite feedstock from Turkey. Turkey was using the colemanite to make value added derivatives for export. The Italian plant was able to continue producing high-purity boric acid during 2003 by importing boron compounds from Russia.

A fuel-cell vehicle that used recyclable sodium borohydride fuel participated in a ride-and-drive display at the Pentagon as part of Earth Day celebrations. A nonflammable fuel cell could improve safety in battle zones, reduce logistic demands of refueling, reduce emissions, and reduce dependence on imported oil. The company that is producing the vehicle received a \$3.5 million grant from the Department of Energy to develop the borohydride-base method of hydrogen generation for fuel uses.

In India, the first herbal contraceptive pill, based on a 2,500-year-old medical text, was being tested. The ancient formulation to control female fertility contained borax.

Exported U.S. borate materials competed with borax, boric acid, colemanite, and ulexite primarily from Turkey, the largest producer of boron ore in the world.

World Production, Reserves, and Reserve Base:⁶

	Production—all forms		Reserves ⁷	Reserve base ⁷
	2002	2003 ^e		
United States	1,050	1,060	40,000	80,000
Argentina	510	170	2,000	9,000
Bolivia	35	33	NA	NA
Chile	330	430	NA	NA
China	145	140	25,000	47,000
Iran	4	4	1,000	1,000
Peru	9	9	4,000	22,000
Russia	1,000	1,000	40,000	100,000
Turkey	1,500	1,500	60,000	150,000
World total (rounded)	4,580	4,350	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.

^eEstimated. E Net exporter. NA Not available.

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

²Less than ½ unit.

³Chemical Market Reporter.

⁴Stocks data are not available and are assumed to be zero for net import reliance and apparent consumption calculations.

⁵Defined as imports – exports + adjustments for Government and industry stock changes.

⁶Gross weight of ore in thousand metric tons.

⁷See Appendix C for definitions.