

BORON

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: Two companies in southern California produced borates in 2019, and most of the boron products consumed in the United States were manufactured domestically. U.S. boron production and consumption data were withheld to avoid disclosing company proprietary data. The leading boron producer mined borate ores, which contain the minerals kernite, tincal, and ulexite, by open pit methods and operated associated compound plants. Kernite was used to produce boric acid, tincal was used to produce sodium borate, and ulexite was used as a primary ingredient in the manufacture of a variety of specialty glasses and ceramics. A second company produced borates from brines extracted through solution-mining techniques. Boron minerals and chemicals were principally consumed in the North Central United States and the Eastern United States. In 2019, the glass and ceramics industries remained the leading domestic users of boron products, accounting for an estimated 80% of total borates consumption. Boron also was used as a component in abrasives, cleaning products, insecticides, and insulation and in the production of semiconductors.

Salient Statistics—United States:	2015	2016	2017	2018	2019^e
Production	W	W	W	W	W
Imports for consumption:					
Refined borax	136	173	158	133	150
Boric acid	40	46	40	51	50
Colemanite (calcium borates)	35	35	58	73	40
Ulexite (sodium borates)	70	43	24	34	35
Exports:					
Boric acid	195	237	227	260	270
Refined borax	528	581	572	610	590
Consumption, apparent ¹	W	W	W	W	W
Price, average value of imports					
Cost, insurance, and freight, dollars per ton	327	352	392	404	377
Employment, number	1,380	1,340	1,300	1,350	1,350
Net import reliance ² as a percentage of apparent consumption	E	E	E	E	E

Recycling: Insignificant.

Import Sources (2015–18): All forms: Turkey, 80%; Bolivia, 13%; Chile, 3%; and other, 4%.

Tariff:	Item	Number	Normal Trade Relations 12–31–19
Natural borates:			
Sodium (ulexite)		2528.00.0005	Free.
Calcium (colemanite)		2528.00.0010	Free.
Boric acids		2810.00.0000	1.5% ad val.
Borates:			
Refined borax:			
Anhydrous		2840.11.0000	0.3% ad val.
Non-anhydrous		2840.19.0000	0.1% 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 with 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 are priced and sold based on their boric oxide (B₂O₃) content, varying by ore and compound and by the absence or presence of calcium and sodium. The four borate minerals—colemanite, kernite, tincal, and ulexite—account for 90% of the borate minerals used by industry worldwide. Although borates were used in more than 300 applications, more than three-quarters of world consumption was used in ceramics, detergents, fertilizers, and glass.

China, India, Indonesia, Malaysia, and the Netherlands are the countries that imported the largest quantities of refined borates from the United States in 2019. Because China has low-grade boron reserves and demand for boron is anticipated to rise in that country, imports to China from Chile, Russia, Turkey, and the United States were expected to remain steady during the next several years.

Continued investment in new borate refineries and the continued rise in demand were expected to fuel growth in world production for the next few years. Two Australia-based mine developers confirmed that production of high-quality boron products is possible from their projects in California and Nevada. These companies have the potential to become substantial boron producers when they are fully developed. Both companies expect production to begin in 2021, with construction beginning at one site by late 2019.

World Production and Reserves: Reserves for Turkey were updated based on company information.

	Production—All forms		Reserves ³
	2018	2019 ^e	
United States	W	W	40,000
Argentina, crude ore	200	100	NA
Bolivia, ulexite	150	210	NA
Chile, ulexite	600	400	35,000
China, boric oxide equivalent	75	250	24,000
Germany, compounds	143	140	NA
Kazakhstan, unspecified	500	—	NA
Peru, crude borates	101	100	4,000
Russia, datolite ore	80	80	40,000
Turkey, refined borates	2,000	2,500	1,100,000
World total ⁴	XX	XX	XX

World Resources: Deposits of borates are associated with volcanic activity and arid climates, with the largest economically viable deposits in the Mojave Desert of the United States, the Alpid 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 deposits in Turkey are colemanite, primarily used in the production of heat-resistant glass. 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, enamels, 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. XX Not applicable. — Zero.

¹Defined as production + imports – exports.

²Defined as imports – exports.

³See Appendix C for resource and reserve definitions and information concerning data sources.

⁴World totals cannot be calculated because production and reserves are not reported in a consistent manner by all countries.