

LITHIUM

(Data in metric tons of contained lithium unless otherwise noted)

Domestic Production and Use: The only lithium production in the United States was from one brine operation in Nevada. Two companies produced a wide range of downstream lithium compounds in the United States from domestic or imported lithium carbonate, lithium chloride, and lithium hydroxide. Domestic production data were withheld to avoid disclosing company proprietary data.

Although lithium markets vary by location, global end-use markets are estimated as follows: batteries, 74%; ceramics and glass, 14%; lubricating greases, 3%; continuous casting mold flux powders, 2%; polymer production, 2%; air treatment, 1%; and other uses, 4%. Lithium consumption for batteries has increased significantly in recent years because rechargeable lithium batteries are used extensively in the growing market for electric vehicles and portable electronic devices, and increasingly are used in electric tools, and grid storage applications. Lithium minerals were used directly as ore concentrates in ceramics and glass applications.

<u>Salient Statistics—United States:</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021^e</u>
Production	W	W	W	W	W
Imports for consumption	3,330	3,420	2,620	2,460	2,500
Exports	1,960	1,660	1,660	1,170	1,900
Consumption, estimated ¹	3,000	3,000	2,000	2,000	2,000
Price, annual average, battery-grade lithium carbonate, dollars per metric ton ²	15,000	17,000	12,700	8,000	17,000
Employment, mine and mill, number	70	70	70	70	70
Net import reliance ³ as a percentage of estimated consumption	>50	>50	>25	>50	>25

Recycling: One domestic company has recycled lithium metal and lithium-ion batteries since 1992 at its facility in British Columbia, Canada. In 2015, the company began operating the first U.S. recycling facility for lithium-ion vehicle batteries in Lancaster, OH. About 25 companies in North America and Europe recycle lithium batteries or plan to do so. Partnerships between automobile companies and battery recyclers have been made to supply the automobile industry with a source of battery materials.

Import Sources (2017–20): Argentina, 54%; Chile, 37%; China, 5%; Russia, 3%; and other, 1%.

<u>Tariff:</u>	<u>Item</u>	<u>Number</u>	<u>Normal Trade Relations</u> <u>12–31–21</u>
	Lithium oxide and hydroxide	2825.20.0000	3.7% ad valorem.
	Lithium carbonate:		
	U.S. pharmaceutical grade	2836.91.0010	3.7% ad valorem.
	Other	2836.91.0050	3.7% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:^{4, 5}

<u>Material</u>	<u>Inventory</u> <u>as of 9–30–21</u>	<u>FY 2021</u>		<u>FY 2022</u>	
		<u>Potential</u> <u>acquisitions</u>	<u>Potential</u> <u>disposals</u>	<u>Potential</u> <u>acquisitions</u>	<u>Potential</u> <u>disposals</u>
Lithium-cobalt oxide	752	—	—	—	—
Lithium-nickel-cobalt-aluminum oxide	2,698	—	—	—	—

Events, Trends, and Issues: Excluding U.S. production, worldwide lithium production in 2021 increased by 21% to approximately 100,000 tons from 82,500 tons in 2020 in response to strong demand from the lithium-ion battery market and increased prices of lithium. Global consumption of lithium in 2021 was estimated to be 93,000 tons, a 33% increase from 70,000 tons in 2020.

Spot lithium carbonate prices in China (cost, insurance, and freight [c.i.f.] North Asia) increased from approximately \$7,000 per ton in January to about \$26,200 per ton in November. For fixed contracts, the annual average U.S. lithium carbonate price was \$17,000 per ton in 2021, more than double that in 2020. Spot lithium hydroxide prices in China (c.i.f. North Asia) increased from approximately \$9,000 per ton in January to about \$27,400 per ton in November. Spot spodumene (6% lithium oxide) prices in China (c.i.f. China) increased from approximately \$450 per ton in January to about \$2,300 per ton in November. Spot lithium metal (99.9% lithium) prices in China increased from approximately \$77,000 per ton in January to about \$97,000 per ton in July.

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Four mineral operations in Australia, two brine operations each in Argentina and Chile, and two brine and one mineral operation in China accounted for the majority of world lithium production. Additionally, smaller operations in Brazil, China, Portugal, the United States, and Zimbabwe also contributed to world lithium production. Owing to the resurgence in demand and increased prices of lithium in 2021, established lithium operations worldwide resumed capacity expansion plans which were postponed in 2020 in response to the global COVID-19 pandemic.

Lithium supply security has become a top priority for technology companies in Asia, Europe, and the United States. Strategic alliances and joint ventures among technology companies and exploration companies continued to be established to ensure a reliable, diversified supply of lithium for battery suppliers and vehicle manufacturers. Brine-based lithium sources were in various stages of development in Argentina, Bolivia, Chile, China, and the United States; mineral-based lithium sources were in various stages of development in Australia, Austria, Brazil, Canada, China, Congo (Kinshasa), Czechia, Finland, Germany, Mali, Namibia, Peru, Portugal, Serbia, Spain, the United States, and Zimbabwe; lithium-clay sources were in various stages of development in Mexico and the United States; and a searlesite source was in development in the United States.

World Mine Production and Reserves: Reserves for Argentina, Australia, and “Other countries” were revised based on new information from Government and industry sources.

	Mine production		Reserves ⁶
	2020	2021 ^e	
United States	W	W	750,000
Argentina	5,900	6,200	2,200,000
Australia	39,700	55,000	75,700,000
Brazil	1,420	1,500	95,000
Chile	21,500	26,000	9,200,000
China	13,300	14,000	1,500,000
Portugal	348	900	60,000
Zimbabwe	417	1,200	220,000
Other countries ⁸	—	—	2,700,000
World total (rounded)	⁹ 82,500	⁹ 100,000	22,000,000

World Resources:⁶ Owing to continuing exploration, identified lithium resources have increased substantially worldwide and total about 89 million tons. Identified lithium resources in the United States—from continental brines, geothermal brines, hectorite, oilfield brines, pegmatites, and searlesite—are 9.1 million tons. Identified lithium resources in other countries have been revised to 80 million tons. Identified lithium resources are distributed as follows: Bolivia, 21 million tons; Argentina, 19 million tons; Chile, 9.8 million tons; Australia, 7.3 million tons; China, 5.1 million tons; Congo (Kinshasa), 3 million tons; Canada, 2.9 million tons; Germany, 2.7 million tons; Mexico, 1.7 million tons; Czechia, 1.3 million tons; Serbia, 1.2 million tons; Russia, 1 million tons; Peru, 880,000 tons; Mali, 700,000 tons; Zimbabwe, 500,000 tons; Brazil, 470,000 tons; Spain, 300,000 tons; Portugal, 270,000 tons; Ghana, 130,000 tons; Austria, 60,000 tons; and Finland, Kazakhstan, and Namibia, 50,000 tons each.

Substitutes: Substitution for lithium compounds is possible in batteries, ceramics, greases, and manufactured glass. Examples are calcium, magnesium, mercury, and zinc as anode material in primary batteries; calcium and aluminum soaps as substitutes for stearates in greases; and sodic and potassic fluxes in ceramics and glass manufacture.

^eEstimated. W Withheld to avoid disclosing company proprietary data. — Zero.

¹Defined as production + imports – exports + adjustments for Government and industry stock changes. Rounded to one significant digit to avoid disclosing company proprietary data.

²Lithium carbonate, contract price, delivered Europe and United States. Source: Fastmarkets IM.

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

⁴See Appendix B for definitions.

⁵Units are kilograms, gross weight.

⁶See Appendix C for resource and reserve definitions and information concerning data sources.

⁷For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 3.8 million tons.

⁸Other countries with reported reserves include Austria, Canada, Congo (Kinshasa), Czechia, Finland, Germany, Mali, Mexico, and Serbia.

⁹Excludes U.S. production.