

LITHIUM

(Data in metric tons, lithium content, unless otherwise specified)

Domestic Production and Use: Commercial-scale lithium production in the United States was from a continental brine operation in Nevada and from brine-sourced waste tailings of a Utah-based magnesium producer. 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 uses vary by location, global end uses were estimated as follows: batteries, 87%; ceramics and glass, 4%; lubricating greases, 2%; air treatment, 1%; continuous casting mold flux powders, 1%; medical, 1%; and other uses, 4%. Lithium consumption for batteries increased significantly in recent years because rechargeable lithium batteries have been used extensively in the growing market for electric vehicles, portable electronic devices, electric tools, and energy grid storage applications. Lithium minerals were used directly as mineral concentrates in ceramics and glass applications.

Salient Statistics—United States:	2019	2020	2021	2022	2023^e
Production	W	W	W	W	W
Imports for consumption	2,620	2,460	2,640	3,270	3,400
Exports	1,660	1,200	1,870	2,440	2,300
Consumption, apparent ¹	W	W	W	W	W
Price, annual average-nominal, battery-grade lithium carbonate, dollars per metric ton ²	12,100	8,600	12,600	68,100	46,000
Employment, mine and mill, number	70	70	70	70	70
Net import reliance ³ as a percentage of apparent consumption	>25	>50	>25	>25	>25

Recycling: Construction of lithium battery recycling plants increased at a rapid pace. In 2023, about 40 companies in Canada and the United States and 50 companies in Europe recycled lithium batteries or planned to do so. Automobile companies and battery recyclers partnered to supply the automobile industry with a source of battery materials.

Import Sources (2019–22): Argentina, 51%; Chile, 43%; China, 3%; Russia, 2%; and other, 1%.

Tariff:	Item	Number	Normal Trade Relations 12–31–23
	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: Not available.

Events, Trends, and Issues: Excluding U.S. production, worldwide lithium production in 2023 increased by 23% to approximately 180,000 tons from 146,000 tons in 2022 in response to strong demand from the lithium-ion battery market. Global consumption of lithium in 2023 was estimated to be 180,000 tons, a 27% increase from the revised consumption figure of 142,000 tons in 2022. However, concern of a short-term lithium oversupply, expiration of the Chinese Government's decade-long program of subsidies for electric vehicle (EV) purchases, and weaker-than-expected EV sales worldwide caused the price of lithium to decrease considerably in 2023.

Spot lithium carbonate prices in China [cost, insurance, and freight (c.i.f.)] decreased from approximately \$76,000 per ton in January to about \$23,000 per ton in November. For fixed contracts, the annual average U.S. lithium carbonate price was \$46,000 per ton in 2023, a decrease of 32% from that in 2022. Spot lithium hydroxide prices in China (c.i.f. China) decreased from approximately \$81,500 per ton in January to about \$22,500 per ton in November. Spodumene (6% lithium oxide) prices in Australia (free on board) decreased from approximately \$6,000 per ton in January to about \$2,500 per ton in November.

Seven mineral operations in Australia, one mineral tailings operation in Brazil, two brine operations each in Argentina and Chile, two mineral operations in Canada, five mineral and four brine operations in China, and one mineral operation in Zimbabwe accounted for the majority of world lithium production. Additionally, smaller operations in Argentina, Australia, Brazil, China, Portugal, the United States, and Zimbabwe also contributed to world lithium

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production. Owing to the rapid increase in demand of lithium in 2023, established lithium operations worldwide increased or were in the process of increasing production capacity.

In 2022, the U.S. Department of Energy selected 12 lithium-based projects funded with \$1.6 billion from the 2022 U.S. Bipartisan Infrastructure Law to support new commercial-scale domestic facilities to extract and process lithium, manufacture battery components, recycle batteries, and develop new technologies to increase U.S. lithium reserves. The 2022 U.S. Inflation Reduction Act added tax incentives to consolidate sourcing of battery materials and manufacturing of EVs to North American and U.S.-partner countries.

Lithium supply security has become a top priority for technology companies in Asia, Europe, and North America. 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 or exploration in Argentina, Bolivia, Canada, Chile, China, and the United States; mineral-based lithium sources were in various stages of development or exploration in Australia, Austria, Brazil, Canada, China, Congo (Kinshasa), Czechia, Ethiopia, France, Finland, Germany, Ghana, India, Iran, Kazakhstan, Mali, Namibia, Nigeria, Peru, Portugal, Russia, Rwanda, Serbia, Spain, Thailand, Turkey, the United States, and Zimbabwe; lithium-clay sources were in various stages of development or exploration in Mexico and the United States.

World Mine Production and Reserves: Reserves for Argentina, Australia, Brazil, China, the United States, and “Other countries” were revised based on company and Government reports.

	Mine production		Reserves ⁴
	2022	2023 ^e	
United States	W	W	1,100,000
Argentina	6,590	9,600	3,600,000
Australia	74,700	86,000	⁵ 6,200,000
Brazil	^e 2,630	4,900	390,000
Canada	^e 520	3,400	930,000
Chile	38,000	44,000	9,300,000
China	^e 22,600	33,000	3,000,000
Portugal	^e 380	380	60,000
Zimbabwe	^e 1,030	3,400	310,000
Other countries ⁶	—	—	<u>2,800,000</u>
World total (rounded)	<u>7146,000</u>	<u>7180,000</u>	<u>28,000,000</u>

World Resources:⁴ Owing to continuing exploration, measured and indicated lithium resources have increased substantially worldwide and total about 105 million tons. Measured and indicated lithium resources in the United States—from continental brines, claystone, geothermal brines, hectorite, oilfield brines, and pegmatites—are 14 million tons. Measured and indicated lithium resources in other countries have been revised to 91 million tons. Resources are distributed as follows: Bolivia, 23 million tons; Argentina, 22 million tons; Chile, 11 million tons; Australia, 8.7 million tons; China, 6.8 million tons; Germany, 3.8 million tons; Canada, 3 million tons; Congo (Kinshasa), 3 million tons; Mexico, 1.7 million tons; Czechia, 1.3 million tons; Serbia, 1.2 million tons; Peru, 1 million tons; Russia, 1 million tons; Mali, 890,000 tons; Brazil, 800,000 tons; Zimbabwe, 690,000 tons; Spain, 320,000 tons; Portugal, 270,000 tons; Namibia, 230,000 tons; Ghana, 200,000 tons; Finland, 68,000 tons; Austria, 60,000 tons; and Kazakhstan, 50,000 tons.

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 industry stock changes.

²Lithium carbonate price assessments for spot and long-term contracts. Source: Benchmark Mineral Intelligence Ltd.

³Defined as imports – exports ± adjustments for industry stock changes.

⁴See Appendix C for resource and reserve definitions and information concerning data sources.

⁵For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 4.8 million tons.

⁶Other countries with reported reserves: Austria, Congo (Kinshasa), Czechia, Finland, Germany, Ghana, Mali, Mexico, Namibia, Serbia, and Spain.

⁷Excludes U.S. production.