

## LITHIUM

(Data in metric tons of lithium content, unless otherwise noted)

**Domestic Production and Use:** Chile was the largest lithium chemical producer in the world; Argentina, China, Russia, and the United States were large producers also. Australia, Canada, and Zimbabwe were major producers of lithium ore concentrates. The United States remained the leading consumer of lithium minerals and compounds and the leading producer of value-added lithium materials. Because only one company produced lithium compounds from domestic resources, reported production and value of production data cannot be published. Estimation of value for the lithium mineral compounds produced in the United States is extremely difficult because of the large number of compounds used in a wide variety of end uses and the great variability of the prices for the different compounds.

The use of lithium compounds in ceramics, glass, and primary aluminum production represented more than 60% of estimated domestic consumption. Other major end uses for lithium were in the manufacture of lubricants and greases and in the production of synthetic rubber.

<b>Salient Statistics—United States:</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002<sup>e</sup></b>
Production	W	W	W	W	W
Imports for consumption	2,590	2,640	2,880	1,990	2,500
Exports	1,340	1,330	1,310	1,480	1,500
Consumption:					
Apparent	W	W	W	W	W
Estimated	2,800	2,800	2,800	1,400	1,600
Price, yearend, dollars per kilogram:					
Lithium carbonate	4.47	4.47	4.47	NA	NA
Lithium hydroxide, monohydrate	5.74	5.74	5.74	NA	NA
Employment, mine and mill, number <sup>e</sup>	100	100	100	100	100
Net import reliance <sup>1</sup> as a percentage of apparent consumption	E	<50%	>50%	<50%	>50%

**Recycling:** Insignificant, but growing through the recycling of lithium batteries.

**Import Sources (1998-2001):** Chile, 80%; Argentina, 16%; and other, 4%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12/31/02</b>
Other alkali metals	2805.19.0000	5.3% ad val.
Lithium oxide and hydroxide	2825.20.0000	3.7% ad val.
Lithium carbonate:		
U.S.P. grade	2836.91.0010	3.7% ad val.
Other	2836.91.0050	3.7% ad val.

**Depletion Allowance:** 22% (Domestic), 14% (Foreign).

**Government Stockpile:** None.

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**Events, Trends, and Issues:** The only active lithium carbonate plant remaining in the United States was at a brine operation in Nevada. Subsurface brines have become the dominant raw material for lithium carbonate production worldwide because of lower production costs as compared with the costs for hard rock ores. Two brine operations in Chile dominate the world market; a facility at a brine deposit in Argentina produced lithium chloride and a limited quantity of lithium carbonate. Most of the lithium minerals mined in the world were consumed as ore concentrates rather than feedstock for lithium carbonate and other lithium compounds.

Two companies produced a large array of downstream lithium compounds in the United States from domestic or South American lithium carbonate. A U.S. recycling company produced a small quantity of lithium carbonate from solutions recovered during the recycling of lithium batteries.

When a Chilean fertilizer producer entered the lithium carbonate market in 1997, it undercut prices by about 50% to establish market share and to increase total demand, especially in new uses. Higher cost facilities closed, but markets have stayed steady. Prices increased by about 10% at the end of 1999 and again in 2000 and 2001, although U.S. price lists are no longer published.

Interest in lithium batteries for electric vehicles (EVs) continued; acceptance, however, of battery-powered EVs was not expanding significantly. Other rechargeable lithium batteries were growing in popularity for powering video cameras, portable computers and telephones, and cordless tools. Nonrechargeable lithium batteries were used in calculators, cameras, computers, electronic games, and watches.

**World Mine Production, Reserves, and Reserve Base:** Reserves and reserve base estimates for Australia, Brazil, and China have been revised based on new information from those countries.

	Mine production		Reserves <sup>2</sup>	Reserve base <sup>2</sup>
	2001	2002 <sup>e</sup>		
United States	W	W	38,000	410,000
Argentina <sup>e</sup>	200	200	NA	NA
Australia <sup>e</sup>	2,000	2,000	160,000	260,000
Bolivia	—	—	—	5,400,000
Brazil	220	220	190,000	910,000
Canada	700	700	180,000	360,000
Chile	6,800	6,800	3,000,000	3,000,000
China	2,400	2,400	540,000	1,100,000
Portugal	200	200	NA	NA
Russia <sup>e</sup>	2,000	2,000	NA	NA
Zimbabwe	700	560	23,000	27,000
World total (may be rounded)	<sup>3</sup> 15,100	<sup>3</sup> 15,100	4,100,000	11,000,000

**World Resources:** The identified lithium resources total 760,000 tons in the United States and more than 13 million tons in other countries.

**Substitutes:** Substitutes for lithium compounds are possible in manufactured glass, ceramics, greases, and batteries. Examples are sodic and potassic fluxes in ceramics and glass manufacture; calcium and aluminum soaps as substitutes for stearates in greases; and calcium, magnesium, mercury, and zinc as anode material in primary batteries. Lithium carbonate is not considered to be an essential ingredient in aluminum potlines. Substitutes for aluminum-lithium alloys as structural materials are composite materials consisting of boron, glass, or polymer fibers in engineering resins.

<sup>e</sup>Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

<sup>1</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

<sup>2</sup>See Appendix C for definitions.

<sup>3</sup>Excludes U.S. production.