

## LITHIUM

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

**Domestic Production and Use:** Chile was the largest lithium chemical producer in the world, followed by China, the United States, Russia, and Argentina, in descending order of production. Australia and Canada 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 two companies produced lithium compounds for domestic consumption as well as for export to other countries, 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>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999<sup>e</sup></b>
Production	W	W	W	W	W
Imports for consumption	1,140	884	975	2,590	2,440
Exports	1,900	2,310	2,200	1,400	700
Consumption: Apparent	W	W	W	W	W
Estimated	2,600	2,700	2,800	2,800	2,800
Price, yearend, dollars per kilogram:					
Lithium carbonate	4.34	4.34	4.47	4.47	4.47
Lithium hydroxide, monohydrate	5.62	5.51	5.74	5.74	5.74
Stocks, producer, yearend	W	W	W	W	W
Employment, mine and mill, number <sup>e</sup>	230	230	230	100	100
Net import reliance <sup>1</sup> as a percent of apparent consumption	E	E	E	W	W

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

**Import Sources (1995-98):** Chile, 76%; Argentina, 20%, and other, 4%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12/31/99</b>
Other alkali metals	2805.19.0000	5.5% 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:** 23% (Domestic), 15% (Foreign).

**Government Stockpile:** None.

## LITHIUM

**Events, Trends, and Issues:** The only active lithium carbonate plant remaining in the United States was at a brine operation in Nevada. Two mines in North Carolina closed, one in 1986 and one in 1998, when their operating companies were able to supply the lithium carbonate required for production of downstream lithium compounds and to meet customer requirements from their brine deposits in South America. Subsurface brines have become the dominant raw material for lithium carbonate production worldwide because of lower production costs as compared to the costs for hard rock ores. Most of the lithium minerals mined in the world were consumed as ore concentrates rather than feedstock for lithium carbonate and other lithium compounds.

The U.S. company with a brine operation in Argentina announced plans to produce only lithium chloride at that operation. The company will meet its lithium carbonate requirements with material purchased from a producer in Chile. The increased production of low-cost lithium carbonate in South America has caused operations in China and Russia to close. Operations in those countries were able to import lithium carbonate from Chile at less than the cost of producing the material domestically.

In addition to the closure of facilities in other parts of the world, increased production in South America continued an oversupply situation that kept prices for lithium carbonate low for the past 3 years, although U.S. company price lists do not reflect that trend. Actual prices paid may have been as much as 50% lower than list prices. Lower prices may benefit the lithium industry in the long run by expanding the use of lithium materials into new high-volume, but price sensitive markets.

Interest in lithium batteries for electric vehicles (EV's) continued and research was ongoing. Lithium batteries could power the majority of future EV's, but the precise battery type and the timetable for implementation were still in question. Early battery designs indicated potential for significant growth in demand for lithium metal for use in batteries. More recent battery research has focused on the use of lithium carbonate rather than lithium metal to avoid some of the safety issues involved when dealing with lithium metal. Use of lithium carbonate simplified the manufacturing process and lowered the cost of lithium battery materials.

### **World Mine Production, Reserves, and Reserve Base:**

	Mine production		Reserves <sup>2</sup>	Reserve base <sup>2</sup>
	1998	1999 <sup>e</sup>		
United States	W	W	38,000	410,000
Argentina <sup>e</sup>	1,130	1,200	NA	NA
Australia <sup>e</sup>	2,100	2,100	150,000	160,000
Bolivia	—	—	—	5,400,000
Brazil	32	30	910	NA
Canada	700	700	180,000	360,000
Chile	4,700	5,000	3,000,000	3,000,000
China	3,000	2,500	NA	NA
Namibia <sup>e</sup>	28	30	NA	NA
Portugal	160	160	NA	NA
Russia <sup>e</sup>	2,000	1,800	NA	NA
Zimbabwe	1,000	1,000	23,000	27,000
World total (may be rounded)	<sup>3</sup> 15,000	<sup>3</sup> 15,000	<sup>4</sup> 3,400,000	<sup>5</sup> 9,400,000

**World Resources:** The identified lithium resources total 760,000 tons in the United States and more than 12 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 zinc, magnesium, calcium, and mercury as anode material in primary batteries. Lithium carbonate is not considered an essential ingredient in aluminum potlines. Substitutes for aluminum-lithium alloys as structural materials are composite materials consisting of glass, polymer, or boron fibers in engineering resins.

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

<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.

<sup>4</sup>Excludes Argentina, China, Namibia, Portugal, and Russia.

<sup>5</sup>Excludes Argentina, Brazil, China, Namibia, Portugal, and Russia.