

## LITHIUM

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

**Domestic Production and Use:** For the first time in history, Chile surpassed the United States as the largest producer of lithium in the world. The U.S. 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><u>Salient Statistics—United States:</u></b>	<b><u>1993</u></b>	<b><u>1994</u></b>	<b><u>1995</u></b>	<b><u>1996</u></b>	<b><u>1997<sup>e</sup></u></b>
Production	W	W	W	W	W
Imports for consumption	810	851	1,140	884	1,100
Exports	1,700	1,700	1,900	2,200	2,300
Consumption: Apparent	W	W	W	W	W
Estimated <sup>1</sup>	2,300	2,500	2,600	2,700	2,700
Price, yearend, dollars per kilogram:					
Lithium carbonate	4.21	4.41	4.34	4.34	4.34
Lithium hydroxide, monohydrate	5.71	5.62	5.62	5.51	5.51
Stocks, producer, yearend	W	W	W	W	W
Employment, mine and mill, number <sup>e</sup>	230	230	230	230	230
Net import reliance <sup>2</sup> as a percent of apparent consumption	E	E	E	E	E

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

**Import Sources (1993-96):** Chile, 97%; and other, 3%.

<b><u>Tariff:</u></b>	<b><u>Item</u></b>	<b><u>Number</u></b>	<b><u>Most favored nation (MFN)</u></b> <b><u>12/31/97</u></b>	<b><u>Non-MFN<sup>3</sup></u></b> <b><u>12/31/97</u></b>
	Other alkali metals	2805.19.0000	5.9% ad val.	25% ad val.
	Lithium oxide and hydroxide	2825.20.0000	3.7% ad val.	25% ad val.
	Lithium carbonate:			
	U.S.P. grade	2836.91.0010	3.7% ad val.	25% ad val.
	Other	2836.91.0050	3.7% ad val.	25% ad val.

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

**Government Stockpile:** None.

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**Events, Trends, and Issues:** A second lithium brine operation in Chile completed its first full year of operation, with higher production of lithium carbonate for the year than was initially expected. Chile should continue as the world's leading lithium producer for the foreseeable future. A brine operation in Argentina was under development by one of the U.S. companies; it experienced some technical problems delaying the initial production at that site. Production began in the third quarter of 1997, and shipments were expected to commence by yearend. As the Argentine operation approaches full production, expected by the end of 1998, the company's spodumene mine in North Carolina will close to take advantage of the significantly lower production cost of lithium carbonate from brine. With this mine closure, lithium carbonate production from hard rock ores in the United States will end. Nearly all the lithium minerals mined in the world will then be used as ore concentrates rather than feedstock for lithium carbonate and other lithium compounds.

The increased production from Chile created an oversupply situation resulting in significantly lower prices for lithium carbonate, although official price listings do not reflect that trend. Reprocessed lithium salts from battery recycling and lithium hydroxide monohydrate from former Department of Energy stocks also were available at discounted prices, causing further downward pressure on lithium 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. A new lithium carbonate plant in Australia was temporarily closed, owing to technical problems and low prices.

Interest in lithium batteries for electric vehicles (EV's) continued to grow and research was ongoing. Lithium batteries could power the majority of future EV's, but the precise battery type and the timetable for implementation was still in question.

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

	Mine production		Reserves <sup>4</sup>	Reserve base <sup>4</sup>
	1996	1997 <sup>e</sup>		
United States	W	W	340,000	410,000
Argentina <sup>e</sup>	8	30	NA	NA
Australia <sup>e</sup>	3,700	2,000	150,000	160,000
Bolivia	—	—	—	5,400,000
Brazil	32	30	910	NA
Canada	690	690	180,000	360,000
Chile	2,700	4,500	3,000,000	3,000,000
China	2,800	2,500	NA	NA
Namibia <sup>e</sup>	48	50	NA	NA
Portugal	160	160	NA	NA
Russia <sup>e5</sup>	800	800	NA	NA
Zimbabwe	500	500	23,000	27,000
World total (may be rounded)	<sup>6</sup> 11,000	<sup>6</sup> 11,000	<sup>7</sup> 3,700,000	<sup>8</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>Based primarily on monitoring at the concentrate stage and assuming a 15% lithium loss during conversion of concentrate into chemicals.

<sup>2</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

<sup>3</sup>See Appendix B.

<sup>4</sup>See Appendix D for definitions.

<sup>5</sup>These estimates denote only an approximate order of magnitude; no basis for more exact estimates is available. Output by Russia has never been reported.

<sup>6</sup>Excludes U.S. production.

<sup>7</sup>Excludes Argentina, China, Namibia, Portugal, and Russia.

<sup>8</sup>Excludes Argentina, Brazil, China, Namibia, Portugal, and Russia.