LITHIUM

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

Domestic Production and Use: The only commercially active lithium mine in the United States was a brine operation in Nevada. The mine's production capacity was expanded in 2012, and a new lithium hydroxide plant opened in North Carolina. Two companies produced a large array of downstream lithium compounds in the United States from domestic or South American lithium carbonate, lithium chloride, and lithium hydroxide. A U.S. recycling company produced a small quantity of lithium carbonate from solutions recovered during the recycling of lithium-ion batteries.

Although lithium markets vary by location, global end-use markets are estimated as follows: ceramics and glass, 30%; batteries, 22%; lubricating greases, 11%; air treatment, 4%; metallurgical, 4%; polymers, 3%; pharmaceuticals, 2%; primary aluminum production, 1%; and other uses, 23%. Lithium use in batteries expanded significantly in recent years because rechargeable lithium batteries were being used increasingly in portable electronic devices and electrical tools.

Salient Statistics—United States:	**2008**	**2009**	**2010**	**2011**	**2012[e]**
Production	W	W	W	W	W
Imports for consumption	3,160	1,890	1,960	2,850	2,700
Exports	1,450	919	1,410	1,310	1,300
Consumption:					
Apparent	W	W	W	W	W
Estimated	2,300	1,300	1,100	[1]2,000	[1]2,000
Employment, mine and mill, number	68	68	68	68	68
Net import reliance[2] as a percentage of apparent consumption	>50%	>50%	>50%	>80%	>70%

Recycling: Recycled lithium content has been historically insignificant, but has increased steadily owing to the growth in consumption of lithium batteries. One U.S. company has recycled lithium metal and lithium-ion batteries since 1992 at its Canadian facility in British Columbia. In 2009, the U.S. Department of Energy awarded the company $9.5 million to construct the first U.S. recycling facility for lithium-ion batteries.

Import Sources (2008–11): Argentina, 52%; Chile, 44%; China, 3%; and other, 1%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–12**
Other alkali metals	2805.19.9000	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: 22% (Domestic), 14% (Foreign).

Government Stockpile: None.

Events, Trends, and Issues: Worldwide lithium production increased in 2012. Production volumes of two major lithium producers in Australia and Chile increased moderately through the third quarter of 2012. Argentina's major lithium producer experienced weather-related complications during the year, which reduced production and delayed efforts to increase production capacity. Industry analysts and the major lithium producers expected worldwide consumption of lithium in 2012 to be between 25,900 and 28,200 tons, increasing by 7.5% to 10% from that of 2011. All of the major brine and mineral-based lithium producers increased their lithium prices in 2012. Many emerging companies continued exploring for lithium on claims worldwide. Numerous claims in Nevada, as well as in Argentina, Australia, Bolivia, and Canada, have been leased or staked.

Subsurface brines have become the leading raw material for lithium carbonate production worldwide because of lower production costs compared with the mining and processing costs for hard-rock ores. Owing to growing spodumene demand from China in the last several years, however, mineral-sourced lithium has gained market share on brine-sourced lithium. Two brine operations in Chile dominate the world market, and a facility at a brine deposit in Argentina produced lithium carbonate and lithium chloride. One new brine operation in Argentina began limited commercial production in 2012, and several additional brine operations were under development. Brine operations in China produced lithium carbonate, lithium chloride, and lithium hydroxide. Lithium minerals were used directly as ore

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concentrates in ceramics and glass applications worldwide and, increasingly, as feedstock for lithium carbonate and other lithium compounds in China.

Owing to China's growing demand for high-quality spodumene by its chemical companies, Australia's leading lithium ore miner doubled its production capacity, raising its total lithium carbonate equivalent production capacity to 110,000 tons per year. A major lithium brine producer agreed to acquire the Australian lithium ore miner in 2012 to diversify its supply of lithium. An emerging Australian lithium ore producer continued lithium concentrate production in Western Australia and opened a lithium carbonate plant in China, where the lithium concentrate was to be converted to battery-grade lithium carbonate and supplied to the Asian market. Utilizing a unique reverse-osmosis process, a California company began producing high-purity lithium carbonate from geothermal brines. The reverse-osmosis process eliminates the need for solar evaporation, a crucial and lengthy procedure in common brine operations. Initial lithium carbonate production capacity was 500 tons per year.

Batteries, especially rechargeable batteries, are the uses for lithium compounds with the largest growth potential. Demand for rechargeable lithium batteries exceeds that of rechargeable nonlithium batteries for use in cellular telephones, cordless tools, MP3 players, and portable computers and tablets. Major automobile companies were developing lithium batteries for electric vehicles and hybrid electric vehicles—vehicles with an internal combustion engine and a battery-powered electric motor. Nonrechargeable lithium batteries were used in calculators, cameras, computers, electronic games, watches, and other devices.

Lithium supply security has become a top priority for Asian technology companies. Strategic alliances and joint ventures have been, and are continuing to be, established with lithium exploration companies worldwide to ensure a reliable, diversified supply of lithium for Asia's battery suppliers and vehicle manufacturers.

World Mine Production and Reserves: The reserve estimates for Australia and Brazil have been revised based on new information from Government and industry sources.

	Mine production		Reserves[3]
	2011	2012[e]	
United States	W	W	38,000
Argentina	2,950	2,700	850,000
Australia	12,500	13,000	1,000,000
Brazil	320	490	46,000
Chile	12,900	13,000	7,500,000
China[4]	4,140	6,000	3,500,000
Portugal	820	820	10,000
Zimbabwe	470	500	23,000
World total (rounded)	[5]34,100	[5]37,000	13,000,000

World Resources: The identified lithium resources total 5.5 million tons in the United States and approximately 34 million tons in other countries. Among the other countries, identified lithium resources for Bolivia and Chile total 9 million tons and in excess of 7.5 million tons, respectively. Identified lithium resources for Argentina, China, and Australia are 6.5 million tons, 5.4 million tons, and 1.7 million tons, respectively; while Canada, Congo (Kinshasa), Russia, and Serbia contain approximately 1 million tons each. Identified lithium resources for Brazil total 180,000 tons.

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

[e]Estimated. W Withheld to avoid disclosing company proprietary data.
[1]Rounded to one significant figure to avoid disclosing company proprietary data.
[2]Defined as imports – exports + adjustments for Government and industry stock changes.
[3]See Appendix C for resource/reserve definitions and information concerning data sources.
[4]Official sources for China's lithium production in 2011 and 2012 reported higher figures than industry sources, which reported, on average, 2,600 metric tons of contained lithium for each year.
[5]Excludes U.S. production.