LITHIUM

By Special Contributors

In 2001, the production and consumption of lithium minerals, mainly spodumene and petalite, grew by 2.4% from the previous year. The Western world's estimated consumption for 2001 was 162,000 t, or 21,337 t lithium carbonate equivalent (LCE).

The main uses of the lithium minerals are as raw materials to the glass, ceramic and metallurgical industries. Thus the demand for the lithium minerals is closely linked to the performance of these industries. Demand in Europe and North America was flat in association with economic recession and the outlook is for modest growth. Many Asian countries continued to recover well during 2001 from their earlier crisis. US users are starting to feel the effects of their strong currency on imports, which are becoming less expensive than comparable domestically produced products.

Over the past decade, the three major producers of the minerals, Sons of Gwalia Ltd (Australia), Tanco (Canada) and Bikita Minerals (Zimbabwe) have met the worldwide demand. Sons of Gwalia Ltd owns the largest operating high grade deposit of lithium ore (spodumene) and the installed production capacity is nearly capable of meeting the present total demand/sales of the minerals itself.

There are several other known deposits of lithium minerals in China, the CIS, Brazil and Canada but these are often of low-grade ores and are either currently uneconomic for producing viable quantities of high-grade products or are awaiting development funding. With the current scenario of higher installed capacity than demand, the entry of new producers is not likely to be an economic proposition in the short term.

The potential new mineral producers continuing in the news were Avalon Ventures and Emerald Fields Resources, both in Canada. The latter had an agreement with Anzim Minerals Ltd, the holding company of Bikita Minerals (Pvt) Ltd, which is believed to have lapsed. Avalon Ventures is seeking capital to finance its project and has changed the scope of the project. To date, neither of these projects has progressed to production. A new speculative assessment of a deposit of petalite in Finland was announced. A deposit in North Korea is producing limited quantities of low-grade spodumene. Metallurg in Brazil is planning to produce a lithium-bearing feldspar for the domestic market in competition with CBL.

Traditional applications of the lithium minerals include the production of heatproof cookware (freezer to oven use), glass ceramics, glass containers, pharmaceutical glass, flaconnage, black and white and colour TV tubes, fibreglass, ceramic frits and glazes, enamels, sanitaryware and porcelain tiles. Black and white TV tube production has been decreasing for many years. Only a few producers remain.

Sales and Production Figures for 2001 - All types of Lithium Minerals

	Capacity (t/a)	Production LCE** (t/a)	Sales (t)	Li_2O Content in Ore
Sons of Gwalia, Australia	150,000	22,500	80,000	4.0%
Tanco, Canada	21,000	3,150	15,000	2.6%
Bikita, Zimbabwe*	55,000	6,050	41,000	1.4%
Brazil (estimated)	6,000	900	6,000	n.a.
Others, Portugal (est)	25,000	1,250	20,000	n.a.
Total	257,000	33,850	162,000	

** includes spodumene, petalite, lithospar etc.*

*** LCE: Lithium Carbonate Equivalent.*

Lithium minerals, when combined with other traditional fluxes like feldspars and nepheline syenite, develop a eutectic mixture that increases the fluxing powers of the traditional flux batches, thereby improving product quality and plant efficiency. Some of the benefits are:

Glass - increased melting rates by lowering its viscosity, lower seed (bubble) count, lower thermal expansion coefficient and higher chemical durability. Another important benefit is the total or partial replacement of fluorine and other refining agents thus enabling reduction of toxic emissions.

Ceramics - lower firing (vitrification) temperature, shorter firing cycle times, lower thermal expansion coefficient, lower pyroplastic deformation and brilliant body and glaze colours.

Lithium Carbonate

Historically, the major feedstock for specialty lithium chemicals was previously high-grade spodumene ore converted to lithium carbonate. However, most lithium carbonate is now sourced from salars in North and South America. These salars are considered to be a cheaper source of producing lithium carbonate. Brine deposits in China have long been under investigations for development. However, they have significant technical and economic problems to overcome.

As in the minerals sector, the lithium carbonate sector is also serviced by only a handful of producers:

- SQM Chemicals, from its brines in Chile, capacity 22,000 t/y of LCE. It is now the largest producer and has announced expansion plans.

- Chemetall GmbH, from its brines in Chile, capacity 15,000 t/y of LCE. It also owns the brines in Nevada (previously owned by Cyprus Foote Minerals before its take-over by Chemetall).

Market Prices in 2001

Material	% Li_2O	Approx. Price	Price/ kg Li_2O
Lithium Carbonate	40.4	US$2,068 - 2,600 / Mt bag or drum	US$5.12 - 6.53
Spodumene Concentrates	6.9 - 7.5	US$365 - 395 / Mt ex seller's warehouse	US$4.84 - 5.27
Glass Grade Spodumene	4.8 - 5.0	US$215 - 230 / Mt ex seller's warehouse	US$4.48 - 4.60
Petalite	4.3	US$180 - 270 / Mt fob Durban*	US$4.18 - 6.28

** Depends on packaging and particle size*

- US-based FMC has shut down carbonate production from its brine operations in Argentina but is believed to continue to supply lithium carbonate from the carbonate supplied by SQM under contract, as well as producing lithium chloride and derivatives.

The main bulk application of technical-grade lithium carbonate is in the aluminium smelting industry and as a feedstock for manufacture of lithium chemicals and lithium metal. For high-grade optical special glasses, high-purity lithium carbonate is preferred to minerals. Lithium carbonate has generally been too expensive to use for lithium mineral applications unless available at the special discounted prices of the late 1990s. However, even then, lithium minerals were generally more technically suitable for the applications.

The major producers increased the price of lithium carbonate in 2001 by 5 - 10%. Higher production costs due to fuel and energy price increases have made increases in the carbonate price more pressing. Consequently, the economic case to use lithium minerals will continue to strengthen in common applications.

The focus for growth in demand for carbonate is more likely as a feedstock in the manufacture of lithium chemicals, such as for use in the production of lithium ion and lithium polymer batteries. This is potentially the largest growth sector in the lithium industry.

Chemetall commissioned a new butyl lithium plant in Germany. SQM is planning to move in to this sector by constructing a plant in Texas, US.

Pricing

The comparative prices of the lithium minerals and lithium carbonate are shown in the second table. The unit cost of lithia (Li_2O) from carbonate is slowly edging in the direction of its pre-1998 levels. The mineral prices, in comparison, have remained relatively stable for the past five years. Marginal increases due to higher fuel, energy and freight costs may arise.

Conclusion

Overall, the market for lithium minerals is expected to remain stable and to experience moderate growth with the development of new applications and the increased awareness and acceptance of the benefits of lithium minerals by numerous producers in the glass, ceramics and metallurgical industries. It is generally recognised that the combined fluxing properties of the lithium minerals are superior to that of lithium carbonate in mineral batches. The added alumina and silica present in the mineral composition enhance batch cost savings, melting properties and production efficiency.