LITHIUM

By Special Contributors

The trend in production and consumption of lithium minerals, mainly spodumene and petalite, in 2000 remained stable and similar to that in the previous year, 1999. Western World's estimated consumption for 2000 was 158,200 t (18,165 lithium carbonate equivalent, LCE).

The main uses of the lithium minerals are as raw materials to the glass, ceramic and metallurgical industries. Thus the performance of these industries is closely linked to the demand of the lithium minerals. The economic crisis in Asia has affected the growth and demand of these minerals. However, demand in Europe and North America continues to be strong and the outlook is for modest growth. Many Asian countries are recovering well in 2000 from their crisis. North American users are starting to feel the effects of their strong currency on imports.

Over the past decade, the three major producers of the minerals, **Sons of Gwalia Ltd** (Australia), **Tanco** (Canada) and **Bikita Minerals** (Zimbabwe) (see Table 1) 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 capable of meeting the present total demand/sales of the minerals.

There are several other known deposits of lithium minerals, in China, the CIS 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, entry of new producers is not likely to be an economic proposition in the short term.

The potential new mineral producers in the news from 1999 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. Under the agreement, Bikita was to support Emerald in the evaluation of the project and provide access to its low-cost production technologies. Avalon Ventures is looking out for capital to finance the project. To date, neither of these projects have progressed to production. New speculative assessment of a deposit of petalite in Finland was announced.

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 television tubes, fibreglass, ceramic frits and glazes, enamels, sanitaryware and porcelain tiles. Black and white television tube production has been decreasing for many years. Only a few producers remain.

Lithium minerals when combined with other traditional fluxes such as 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. An 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.

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

1. SQM Chemicals, from its brines in Chile, capacity 20,000 t/y of LCE. It is now the largest producer.

2. 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)

3. FMC, US, has shut down its brine operations in Argentina but is believed to continue to supply carbonate and to produce lithium chloride and derivatives from the carbonate supplied by SQM under contract.

The main application of lithium carbonate is in the aluminium smelting industry and as a feedstock for manufacture of lithium chemicals and lithium metal. For certain special glasses, lithium carbonate is preferred to minerals. Lithium carbonate has generally been too expensive for lithium-mineral applications unless it was available at the

Lithium Sales and Production Figures for 2000

	Production Capacity (t/y)	Sales (t)	Li_2O Ore Content
Sons of Gwalia, Australia	150,000	67,600	4.0%
Tanco, Canada	21,000	15,000	2.6%
Bikita, Zimbabwe*	55,000	49,600	1.4%
Brazil (estimated)	6,000	6,000	n.a.
Others, Portugal (est.)	25,000	20,000	n.a.
Total	**257,000**	**158,200**	-

* includes spodumene, petalite, lithospar etc..

special discounted prices of the late 1990s.

The price of lithium carbonate was increased twice – in the June and December quarters of 2000 - by 5-10%, by the major producers. Higher production costs due to fuel and energy price increases have made increases in the carbonate price more pressing. Consequently, replacement of minerals with lithium carbonate in many applications will become even less economic in the future.

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 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 Table 2. The unit cost of Lithia Li_2O from carbonate is slowly edging in the direction of its pre-1998 levels. However, it is not expected to return close to them. 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.

Lithium Minerals and Carbonate Prices (2000)

Material	% Li_2O	Approx. Price US$/t	US$/kg Li_2O
Lithium Carbonate	40.4	2,068 - 2,600 bag or drum delivered US*	5.12 - 6.53
Spodumene Concentrates	6.9 - 7.5	365 - 395 ex seller's warehouse US	4.84 - 5.27
Glass Grade Spodumene	4.8 - 5.0	215 - 230 ex seller's warehouse US and Europe**	4.48 - 4.60
Petalite	4.3	180 - 270 fob Durban**	4.18 - 6.28

* Source : *Mineral Price Watch*, December 2000
**Depends on packaging and particle size