

# T I C

## TANTALUM-NIOBIUM INTERNATIONAL STUDY CENTER

### PRESIDENT'S LETTER

It appears that this year 2001 will be quite different from last for the tantalum and niobium businesses. While the statistics are not yet available, some reports indicate that market demand increased as much as 25% last year! But now it is widely acknowledged that the electronics industry (and global economies generally) are slowing down. For some of our members, this may be a good opportunity to catch up from the surge in 2000 and prepare for the next upturn! A flat year in 2001 is never a welcome prospect, but certainly tantalum and niobium have a bright future as world economies begin to pick up again later this year or in 2002.

As usual, there is debate about just how much and for how long the market will slow. Some suggest that growth will resume during the second half of the year. Others believe that recovery will be in 2002. But most are optimistic that the markets will continue to place great value on the unique properties of tantalum and niobium, ensuring a bright future!

We are also excited about the Forty-second T.I.C. General Assembly meeting to be held October 7th-9th 2001 in Rio de Janeiro, Brazil. Planning is under way for what promises to be an excellent meeting, hosted by CBMM.

Best regards,  
Tom Odle  
President

### PROCEEDINGS

The Proceedings of Symposium 2000 will be published shortly. For more information on this book, please contact T.I.C. or see Bulletin 106

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### RIO DE JANEIRO

The next meeting of the Tantalum-Niobium International Study Center will take place in Rio de Janeiro from October 7th to 9th 2001.

The Forty-second General Assembly will be convened on Monday October 8th, and a programme of technical papers focussing mainly on niobium, but also covering tantalum, will follow for the rest of the day.

Our host company CBMM, Companhia Brasileira de Metalurgia e Mineração, parent company of Reference Metals, will most generously sponsor a gala dinner on the evening of Monday and a cocktail reception on Sunday October 7th.

On Tuesday October 9th a plane will be chartered to take the group to Araxá for a tour of the niobium mine and installations of CBMM, delegates will be the guests of CBMM for the day.

The meeting and social events will take place at the Hotel Meridien, Copacabana, where delegates will stay – a splendid setting in an exciting city.

Invitations and full details will be sent to member companies. Others interested in attending, but whose companies are not members of the association, should contact the T.I.C. headquarters at 40 rue Washington, 1050 Brussels, Belgium; telephone +32.2.649.51.58, fax +32.2.649.64.47, e-mail tantniob@xs4all.be. All bookings and reservations will be made through the T.I.C.

### TANTALUM

#### RAW MATERIAL SUPPLY

*This paper was presented by Mr John Linden, Head of Marketing, Sons of Gwalia, at Symposium 2000, San Francisco, October 2000*

#### TANTALUM SUPPLY

##### Type of supply

The nature and source of tantalum raw material supply continues to increase from hard rock mine supply as the traditional sources from tin slags and alluvial and eluvial deposits continue to decline.

The cheapest production is still tin slags or tantalum alloys



as a by-product from tin smelting, followed by the eluvial production in Central Africa.

The production of synthetic concentrates from old accumulations of low grade slags continues to be an important source of tantalum but production costs are rising as lower grade slags are being used.

As prices rise, lower grade easy-to-mine resources become economic and lower grade hard rock ore bodies are considered for development.

The DLA has got its timing right and supplies an important 50,000lb per annum tantalum and 300,000lb per annum Ta<sub>2</sub>O<sub>5</sub> and can sustain this level of release for the next 10 years.

The future of the tantalum industry lies in the traditional mining of hard rock orebodies by both open cut and underground means on a reasonably large scale.

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## AFRICA

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### Ethiopia

#### Kenticha

The Kenticha mine has recently been sold by the Ethiopian Minerals Development Authority to Midroc, a wholly owned subsidiary of National Mining Corporation, a local mining company owned by Sheikh Mohammed Al Amoudi.

Kenticha has gradually increased production from 50,000lb per annum Ta<sub>2</sub>O<sub>5</sub> to some 120,000lb per annum Ta<sub>2</sub>O<sub>5</sub>. All production is sold by open tender to the highest bidder. Production has traditionally come from a small washing plant fed by a front end loader. Only the weathered pegmatite and eluvial ore has been excavated and processed.

The opportunity now exists for the new owners to increase production by investing in exploration and new plant and equipment to increase the throughput capacity of the eluvial treatment plant. Production from the soft rock operation could be readily increased to the 250,000lb Ta<sub>2</sub>O<sub>5</sub> level within 18 months of a commitment to develop.

In the longer term, production has to come from the hard rock ore resources and this will require investment in mine development, a crushing and milling plant. Depending on the throughput capacity of such a facility, the investment cost will be substantial.

Hard rock ore reserves are at an early stage of definition and a large amount of drilling remains to be done. Initial indications are that tonnes could be significant, sufficient for a reasonably long mine life, and grades are around 200 grams per tonne. Production for this size operation could be 200,000 – 500,000lb Ta<sub>2</sub>O<sub>5</sub> per annum and be on-stream after one year's drilling and two years' engineering and implementation.

Logistics in the area of the mine are reasonable, with a large gold mine owned by the same group only 20 km away.

### Mozambique

#### Morrua

The Morrua Project has been extensively drilled and

evaluated. An orebody consisting of 6 million tonnes at 450 grams per tonne, accessible by open cut mining, has been delineated.

Ownership of the project is split between three groups and, to date, no decision has been made to commence development. Capital cost to develop a project with a production capacity of some 500,000lb Ta<sub>2</sub>O<sub>5</sub> per annum is likely to be significant, including significant infrastructure cost for power and water. Additional local problems include the presence of land mines and the absence of townsite or amenities of any kind.

#### Marropino

The general region around the Morrua deposit contains other potential tantalum deposits which have been explored to some extent. These are likely to be smaller than Morrua and still require significant exploration drilling before a decision can be made on their development.

Alluvial and eluvial deposits on this mineralised pegmatite belt are now the subject of some development. A processing plant is under construction and first production is expected in 2001. Scale of operation is still to be tested but the opportunity exists to move from soft rock to hard rock mining over some years.

Production starting at 100,000lb and increasing to 300,000lb Ta<sub>2</sub>O<sub>5</sub> per annum has been allowed.

### Central Africa

The countries of the Democratic Republic of the Congo, Rwanda, Burundi and Uganda have long been significant producers of tantalum concentrates. All production comes from alluvial and eluvial deposits which are worked by family groups and prospectors, essentially without the aid of any significant equipment.

Production from these countries in this way has been going on for 40 years and the quantities go up and down with the prices for tantalite, cobalt and gold.

It is estimated that, traditionally, production fluctuates from 300 to 500,000lb of Ta<sub>2</sub>O<sub>5</sub> per annum but, since the increases in the price of tantalite during 2000, production is estimated to have risen sharply to approximately 1 million lb Ta<sub>2</sub>O<sub>5</sub> per annum levels.

The industry still lacks any form of sophistication and there has not been any investment in plant and machinery to speak of. Production is expected to stay at current historically high levels while prices remain high for tantalum and low for the other metals.

Major companies have refrained from investing in these countries due to the political risk associated with these investments.

### Zimbabwe

Zimbabwe has a number of pegmatite areas that have been subject to exploration and exploitation for a number of years. Tantalite is produced in only small quantities from some of these deposits and is sold through the collection system operating in Central Africa. Total current production is nominal at 20,000lb Ta<sub>2</sub>O<sub>5</sub> per annum but potential exists to increase production through systematic exploration and exploitation.



## Nigeria

Nigeria is a long established producer of columbite concentrates. Coltan is produced from a number of places and accumulated by traders before export to Europe. It is difficult to estimate the quantity shipped out but there is no doubt the quantity has increased significantly in the past 12 months as the price has risen. Production that has traditionally been at the 50,000lb Ta<sub>2</sub>O<sub>5</sub> level is now estimated to be closer to the 200,000lb per annum level.

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## AUSTRALIA

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### Greenbushes Mine

Production from the long established Greenbushes Mine is set to increase again. Sons of Gwalia has announced plans to increase production from the current level of 650,000lb Ta<sub>2</sub>O<sub>5</sub> per annum to 1,300,000lb Ta<sub>2</sub>O<sub>5</sub> per annum over the next 3 years. Production will be increased by doubling the size of the plant to be able to treat approximately 3 million tonnes of ore per annum and the ore will come from an expanded open cut as well as a new underground mine.

The plant and the open cut ore will be in production from early 2002, while the ore from the underground mine will gradually increase to one million tonnes per annum over 3 years starting in 2002. The underground mine cannot be developed earlier because of the need to commence the access to the orebody by way of a decline from the bottom of the existing opencut.

Development costs are estimated at A\$35 million for the underground mine and A\$30 million for the treatment plant with significant additional capital for infrastructure and working capital.

All Government approvals are in place for this development proposal so there will be no hold ups due to the need to carry out environmental studies.

The mine will have a known life of some 20 years at this rate of production on the existing ore reserves and significant potential exists to increase these reserves through further drilling.

Expansion beyond 1,300,000lb Ta<sub>2</sub>O<sub>5</sub> per annum is the subject of a scoping study but would require significant time and expense for exploration drilling, feasibility studies, government permitting and implementation. Current estimates suggest a time frame of some years from date of a decision to proceed, to achieve production levels of 2,000,000lb Ta<sub>2</sub>O<sub>5</sub> per annum.

### Wodgina Mine

The 1999 expansion of the Wodgina mine was completed successfully and the mine is now producing at the rate of 500,000lb Ta<sub>2</sub>O<sub>5</sub> per annum. The recently announced further expansion will take this to in excess of 1,000,000lb of Ta<sub>2</sub>O<sub>5</sub> per annum. First production at the expanded rate is scheduled for the first quarter of 2002. During the next 18 months, the plant has to be expanded to handle an ore throughput rate of 2.5 million tonnes per annum.

The open cut mine will be geared up during the next 12 months and will be ready before the plant expansion is complete. The orebody is shallow and flat lying and therefore overburden removal is relatively low. The other major feature of the flat lying pegmatites is that the ones nearest the surface

are also the ones with the highest grades. This means that, for a fixed plant capacity, production will decrease over time.

Increased production at Wodgina will depend on the eventual size of the resource which has not been fully explored.

Production could be increased from both Greenbushes and Wodgina processing plants by adding a flotation recovery section to both plants.

There are a number of known mineralised deposits in the Wodgina district but, of the ones where exploration has been carried out, none of them are very large and exploration is at a very early stage. It would be possible to set up independent production facilities on some of these resources but production would be less than 50,000lb Ta<sub>2</sub>O<sub>5</sub> per annum.

### Other

Since the increase in tantalum prices starting at the end of 1999, there has been increased activity in trying to locate new tantalum deposits. In Australia, this has resulted in a number of exploration companies becoming interested in exploring for and developing new mines. It can be expected that with this activity will come some success.

### Haddington Resources

This company is developing a mine on leases owned by Gwalia and is expected to be in production by July 2001 at the rate of 100,000lb Ta<sub>2</sub>O<sub>5</sub> per annum for a period of 5 years. The mine is an open cut located near Kalgoorlie in Western Australia and has a grade of some 400 grams per tonne. The ore body is limited in size and is unlikely to be capable of sustaining a larger production.

### Australasian Gold Mines

This company has two prospects, one in Western Australia and one in Victoria where known existing tantalite mineralisation occurs. Exploration is at an early stage and, so far, known reserves are either limited in quantity or low in grade. Production on a small scale (20,000lb per annum) is possible in the short term.

**Kanowna Bell and Alkane Exploration** are both exploring areas of previously known tantalite mineralisation but it is too early to tell if economic deposits exist.

### Anaconda

Anaconda has entered into an agreement to acquire the rights to the tantalum and niobium in the Mt. Weld rare earth deposit. This deposit is a circular carbonatite with various levels of different mineralisation. The tantalum and niobium occur as a very fine pyrochlore clay from which it is very difficult to produce a mineral concentrate. The grades at 300 grams per tonne and higher in some places are quite attractive but the difficult nature of the ore means recoveries will be low. A significant amount of research and development needs to be completed before a feasibility study will be available on this deposit.

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## BRAZIL

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Brazil is a large country containing the world's largest niobium mine at Araxá. Tantalum is produced from a number of different sources but there is no single large primary mine



production. The country is producing some 500,000lb of Ta<sub>2</sub>O<sub>5</sub> per annum and has the potential to significantly increase this if the full development potential of the Pitinga tin mine is realised.

#### **Metallurg**

Metallurg operates a tantalum mine and small tin smelter and solvent extraction plant near St João del Rei in Rondonia State. The mine is in the process of being recommissioned after additional ore reserves were discovered. Production is expected to stabilise at approximately 100,000lb per annum.

The Fluminense subsidiary operates a tin smelter and tantalum and niobium solvent extraction plant nearby. The tin smelter produces a tantalum-rich slag which, together with imported raw materials, is processed in the solvent extraction plant. Total production is some 280,000lb of Ta<sub>2</sub>O<sub>5</sub> as pure oxide per annum.

Metallurg also buys concentrates of tin and tantalite from other local producers and further processes them at Fluminense.

#### **Paranapanema**

Paranapanema operates the Pitinga tin mine in the Amazonas region of north western Brazil. This mine produces tin concentrates and a tin / columbite middling product. All concentrates and middlings are transported to the Mamoré smelter in São Paulo which operates as a subsidiary of Paranapanema. At the smelter, the middling product is smelted to produce an alloy which assays approximately 50% Nb<sub>2</sub>O<sub>5</sub> and 5% Ta<sub>2</sub>O<sub>5</sub>. This alloy is currently sold to the market as a raw material source of tantalum and niobium. Total production is 220,000lb of Ta<sub>2</sub>O<sub>5</sub> per annum.

The Mamoré smelter has large stockpiles of tin slags (estimated at 150,000 tonnes at 1.6% Ta<sub>2</sub>O<sub>5</sub>) containing some 5 million lb of Ta<sub>2</sub>O<sub>5</sub>. The Nb to Ta ratio is 10:1 and radioactive element concentrations are high, making transportation difficult.

The company has plans to develop the hard rock component of the Pitinga mine, known as the Rocha Sa project, which when in full production would significantly increase the quantity of middlings produced and could add up to 1,000,000lb of Ta<sub>2</sub>O<sub>5</sub> supply. The main issue is the radioactivity content and the fact that the Ta<sub>2</sub>O<sub>5</sub> will be in a product with 10,000,000lb of Nb<sub>2</sub>O<sub>5</sub> unless a solvent extraction plant is installed to produce the pure oxides of tantalum and niobium.

#### **Garimpos**

Production of minerals by prospectors is common in Brazil and gold, tin and tantalite are the favourites. The production is collected by traders who then sell on to processors. It is estimated that approximately 100,000lb per annum is produced in this way.

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## **CANADA**

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#### **Tanco**

This mine is owned by Cabot and has been in production for more than 20 years. As well as tantalum, the mine also produces spodumene and pollucite for the production of cesium formate for the oil drilling industry. Production is from an underground mine accessed by decline and shaft. The pegmatite orebody is limited in extent and, as a result, production has stabilised at approximately 150,000lb Ta<sub>2</sub>O<sub>5</sub> per annum. Ore reserves are sufficient to last for some 10 years.

#### **Other**

Recent exploration successes have uncovered a number of pegmatites that are mineralised in lithium minerals and have some associated tantalum. When production of the lithium minerals commences, some tantalum will also be produced as a by-product.

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## **CHINA**

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China's production of tantalum has been in decline for the past 10 years as deposits become depleted, grades reduce and costs increase. With increasing demand and some new discoveries, recent announcements point to investment in new production capacities.

#### **Altai Region**

This area, near the Mongolian and Kazakhstan borders, has traditionally produced most of the country's lithium and tantalum minerals. Production has steadily dropped from the 150,000lb level to the current 50,000lb Ta<sub>2</sub>O<sub>5</sub> per annum. The circular zoned pegmatite orebody has been mined to a depth below the surrounding landscape and further extraction will require significant investment in overburden removal.

#### **Yichun**

This major petalite producer in central China has been increasing its tantalum production and is now the largest producer in the country at 120,000lb Ta<sub>2</sub>O<sub>5</sub> per annum. Further increases in production are possible but will require significant capital expenditure on new infrastructure such as tailings dams and power supplies.

#### **Other**

Minor production comes as a by-product from the Limu tin mine in the south and the Ma Ar Kan spodumene mine in Sichuan Province. Total by-product production is estimated at less than 25,000lb of Ta<sub>2</sub>O<sub>5</sub> per annum.

#### **Nanping**

This is a new mine development that is scheduled to begin production in September 2000. The mine is a small underground development and is scheduled to increase output gradually to a maximum of 150,000lb Ta<sub>2</sub>O<sub>5</sub> per annum over a 3 to 5 year period.

#### **Mine 801**

This project was first announced in July 2000 and is located in Mongolia very close to the Chinese border. It is an open-cuttable hard rock deposit with both tantalum and niobium. Ore reserves appear to be substantial but grades are less than 200 grams per tonne Ta<sub>2</sub>O<sub>5</sub>. The higher content of Nb<sub>2</sub>O<sub>5</sub> tends to suggest the mineral may be a columbite. First production is estimated in 2003 which could build up considerably over time.

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## **SOUTH-EAST ASIA**

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This region of the world has traditionally been a significant supplier of tantalum raw materials, mainly as a by-product of tin production over a long period. Tantalum occurs in the form of Low Grade Tin Slag (LGS), Tin Slag (TS), tantalite concentrate, and struverite. Yeap Soon Si's paper last year set out in detail the position with the availability of LGS. For the purposes of completing the supply picture, it is assumed that 500,000lb Ta<sub>2</sub>O<sub>5</sub> per annum will continue to be recovered and shipped from South-east Asia to processors for the production



of synthetic concentrates. As prices increase, it will become more economic to recover lower grade slags which in turn will make more material available.

## THAILAND

### Thaisarco

This tin smelter produces tin slags containing approximately 10% Ta<sub>2</sub>O<sub>5</sub>. The quantity produced is now on the increase, rising from some 75,000lb Ta<sub>2</sub>O<sub>5</sub> per annum several years ago to in excess of 100,000lb Ta<sub>2</sub>O<sub>5</sub> per annum today. Further production increases are entirely dependent on the availability of cassiterite with a Ta<sub>2</sub>O<sub>5</sub> content. The days when production was in excess of 500,000lb Ta<sub>2</sub>O<sub>5</sub> per annum are over and will not return, due to the decline in offshore tin dredging operations.

### S A Minerals

This company processes "amang" from past tin mining operations and separates out the cassiterite, zircon and struverite valuable minerals. Tantalite concentrates are also produced and purchased from other operations and separated. Total production in all forms of Ta<sub>2</sub>O<sub>5</sub> is estimated at some 200,000lb of Ta<sub>2</sub>O<sub>5</sub> without including LGS.

## MALAYSIA

### Malaysian Smelting Corporation

This tin smelter produces only LGS as there is no separation of tin concentrates prior to smelting. The large accumulations of LGS have all been collected and shipped to processors for production of synthetic concentrates. Annual production is low, at less than 50,000lb Ta<sub>2</sub>O<sub>5</sub> per annum.

### BEH Minerals

Reprocessing of mined tailings produces mainly struverite containing 9 to 12% Ta<sub>2</sub>O<sub>5</sub> similar to the operations of S A Minerals. Total annual production is less than 50,000lb Ta<sub>2</sub>O<sub>5</sub>.

## TABLES 1-6: TANTALUM PRODUCTION

	Product	1999	2000	2001	2002	2003
Kenticha	Conc 30%	120	120	120	150	200
Central Congo						
Uganda						
Rwanda/Burundi						
Zimbabwe	Conc 25%	550	1,000	1,100	1,000	900
Mozambique				100	200	300
Nigeria	Columbite 10%	100	200	200	200	200
<b>Total</b>		<b>770</b>	<b>1,320</b>	<b>1,520</b>	<b>1,550</b>	<b>1,600</b>

Table 1: TANTALUM PRODUCTION – Africa ('000lb Ta<sub>2</sub>O<sub>5</sub>)

Producer	Product	1999	2000	2001	2002	2003
Greenbushes	Conc 30%	690	740	780	950	1,100
Wodgina	Conc 40%	350	550	550	1,000	1,200
Other	Conc 30%			100	150	150
<b>Total</b>		<b>1,040</b>	<b>1,290</b>	<b>1,430</b>	<b>2,100</b>	<b>2,450</b>

Table 2: TANTALUM PRODUCTION – Australia ('000lbTa<sub>2</sub>O<sub>5</sub>)

Producer	Product	1999	2000	2001	2002	2003
Mamoré	Alloys 5%	220	220	240	240	240
Fluminense*	Oxide 100%	200	200	250	250	250
Metallurg	Conc 30%			50	100	150
Other	Conc 25%	50	50	100	100	100
<b>Total</b>		<b>470</b>	<b>470</b>	<b>640</b>	<b>690</b>	<b>740</b>

\*From locally sourced raw materials

Table 3: TANTALUM PRODUCTION – Brazil ('000lb Ta<sub>2</sub>O<sub>5</sub>)

Producer	Product	1999	2000	2001	2002	2003
Tanco	Conc	150	150	150	150	150
Other					50	100
<b>Total</b>		<b>150</b>	<b>150</b>	<b>150</b>	<b>200</b>	<b>250</b>

Table 4: TANTALUM PRODUCTION – Canada ('000lb Ta<sub>2</sub>O<sub>5</sub>)

	Product	1999	2000	2001	2002	2003
Altai	Conc	50	50	50	50	50
Nanping	Conc		20	100	150	150
Yichun	Conc	100	120	120	150	150
Mine 801	Conc					100
Other	Conc	50	50	50	50	50
<b>Total</b>		<b>200</b>	<b>240</b>	<b>320</b>	<b>400</b>	<b>500</b>

Table 5: TANTALUM PRODUCTION – China ('000lb Ta<sub>2</sub>O<sub>5</sub>)

	Product	1999	2000	2001	2002	2003
S E Asia	Slag <2%	1,000	700	500	500	500
	Struverite	50	50	50	50	50
Thailand	Slag >5%	50	60	100	120	120
	Conc	100	150	200	200	200
<b>Total</b>	<b>&gt;2% only</b>	<b>200</b>	<b>260</b>	<b>350</b>	<b>370</b>	<b>370</b>

Table 6: TANTALUM PRODUCTION – South-east Asia ('000lb Ta<sub>2</sub>O<sub>5</sub>)

## SUPPLY AND DEMAND BALANCE

The tantalum raw material supply side of the industry has always been able to supply whatever level of demand is required but not always in the timeframe required by consumers. Shortages lead to price increases which in turn stimulate increased production and decreased demand.

The hardest thing for the industry to do is to forecast demand accurately within a timeframe that will allow new production of raw materials to be brought on-stream and allow the processors to install the necessary capacity to satisfy that demand.

We are going through another period of unprecedented growth in demand and the question for the industry is: "What is the rate of growth of demand and is it sustainable?".

The figures presented in this paper indicate that current and foreseeable supply is sufficient to supply current levels of demand and a growth rate of up to 10% per annum over the next 3 years (see tables).



If, however the rate of growth in demand is closer to or greater than 20% then additional new production needs to be brought on-stream as quickly as possible and the processors and capacitor manufacturers need to significantly increase their production capacities (see tables).

Such new production is available from identified resources in Australia, Mozambique and China but has not yet been factored into the supply equation.

Processor Shipment figures from the T.I.C. statistics show a growth rate for tantalum as a whole over the period 1996, 97 and 98 of approximately 8% but for the past year this rate appears to have increased to some 30%.

It is at this stage not clear if this 30% growth rate is actual and sustainable or includes an element of inventory build-up in capacitors and powders. There is sufficient evidence available to indicate tantalum demand is currently growing at between 10 and 30% per annum but the long term sustainable rate of growth is not known.

At a growth rate of 10% per annum in tantalum demand, the current supply and inventory base is sufficient to meet increased demand through 2003.

The current supply base, in particular Australia, has the ability to increase supply to meet a sustainable 10% growth in demand.

At a growth rate of 20% per annum, the current supply base is insufficient and expansion of existing and new mines must be developed to meet increasing demand beyond 2003.

Such additional production can be supplied from

Existing Mines	1,700
Kenticha	500
Morrua	500
Mine 801	300
Pitinga	500

The decision to invest in these resources will depend upon:

- (i) the availability of secure sales contracts for raw materials and processor products at prices that reflect market conditions and return on investment required, and
- (ii) installation of the production capacity required across all levels of the tantalum industry.

## CONCLUSION

It is clear that there is a real current shortfall and a potential shortage of raw materials if demand growth rates in the range of 15 to 20% per annum continue. However, it is also clear that there are sufficient resources globally to provide long term security of supply to the tantalum industry provided that these resources are developed in a timely manner and in accordance with the demand for raw materials.

The forward estimates of this demand must be flagged to the raw material suppliers which will require research and good faith communication across the tantalum industry.

Sons of Gwalia can increase its production capacity significantly, over and above that already announced, given its very large resource base.

The decision by Sons of Gwalia, or others, to invest, expand and develop these resources will depend upon a number of issues including:

- the availability of secure sales contracts for raw materials and processor products at prices which reflect both market conditions and return on investment required, and
- timely installation of the production capacity required across all levels of the tantalum industry.

Given the resources which exist, there is no reason to suggest that the industry cannot continue to expand and grow, provided the industry works together to ensure that the supply chain and production capacity are co-ordinated to meet the market requirements.

## TABLES 7-8: DEMAND FOR ORE

	Unit	1999	2000	2001	2002	2003
Shipments	'000lb Ta	3,830	5,000	5,500	6,100	6,800
Less:						
Scrap	'000lb Ta	800	950	1,250	1,375	1,525
DLA	'000lb Ta	50	50	90	90	90
Demand	'000lb Ta	2,980	4,000	4,160	4,635	5,180
<b>Ore needed</b>	<b>'000lb Ta<sub>2</sub>O<sub>5</sub></b>	<b>4,000</b>	<b>5,400</b>	<b>5,600</b>	<b>6,260</b>	<b>6,990</b>
Less supply		3,830	4,890	5,710	6,610	7,210
Surplus (deficit)		(170)	(510)	110	350	220

Table 7: Demand for ore – growth 10% per annum

	Unit	1999	2000	2001	2002	2003
Shipments	'000lb Ta	3,830	5,000	6,000	7,200	8,640
Less:						
Scrap	'000lb Ta	800	950	1,250	1,500	1,800
DLA	'000lb Ta	50	50	90	90	90
Demand	'000lb Ta	2,980	4,000	4,640	5,610	6,750
<b>Ore needed</b>	<b>'000lb Ta<sub>2</sub>O<sub>5</sub></b>	<b>4,000</b>	<b>5,400</b>	<b>6,260</b>	<b>7,570</b>	<b>9,110</b>
Less supply		3,830	4,890	5,710	6,160	7,210
Surplus (deficit)		(170)	(510)	(550)	(960)	(1,900)

Table 8: Demand for ore – growth 20% per annum

## TABLE 9: SUMMARY

	1999	2000	2001	2002	2003
Africa	770	1,320	1,520	1,550	1,600
Australia	1,040	1,290	1,430	2,100	2,450
Brazil	470	470	640	690	740
Canada	150	150	150	200	250
China	200	240	320	400	500
S E Asia	200	260	350	370	370
Russia/ Kazakhstan	100	100	100	100	100
Other	50	50	50	50	50
Total production	2,980	3,880	4,560	5,460	6,060
DLA	200	360	400	400	400
Synthetic	650	650	750	750	750
<b>Total supply</b>	<b>3,830</b>	<b>4,890</b>	<b>5,710</b>	<b>6,610</b>	<b>7,210</b>

Table 9: Summary of supply ('000lb Ta<sub>2</sub>O<sub>5</sub>)



The Annual Materials Plan for fiscal year 2001 (October 1st 2000 to September 30th 2001) announced by the Defense Logistics Agency on October 3rd 2000 included the following:

Columbium carbide powder	21 500lb Cb
Columbium concentrates	375 000lb Cb
Ferro-columbium	150 000lb Cb
Columbium metal ingots	20 000lb Cb

Tantalum carbide powder	4 000lb Ta
Tantalum metal ingots	40 000lb Ta
Tantalum metal powder	50 000lb Ta
Tantalum minerals	300 000lb Ta
Tantalum oxide	20 000lb Ta

These amounts represent the maximum quantity of material which may be sold.

#### Columbium materials

*Columbium carbide powder:* Offerings were due to begin on November 17th 2000, but we have not yet found any information on sales.

*Columbium metal ingots:* Following the offering on December 8th, an award of 20 000lb to ABS Alloys and Metals was announced on December 21st. This exhausts the quantity included in the initial sales plan for the year.

*Columbium concentrates:* No news of offerings or awards had been posted on the web site at the time of going to press.

*Ferro-columbium:* Again, no news had been posted.

#### Tantalum materials

*Tantalum carbide powder:* 4 000lb was awarded to Sandvik and to ELG Metals on December 8th 2000, thus exhausting the materials available.

*Tantalum metal ingots:* 32 000lb was awarded to Claris Partners, Cabot and H.C. Starck Inc. on December 18th 2000 (offering date November 20th). Bids for the remaining 8 000lb were scheduled for February 26th 2001.

*Tantalum metal powder, capacitor grade:* 11 000lb was awarded to H.C. Starck Inc. on January 31st 2001 (offering date December 14th, postponed to January 11th). A date for further offerings would be announced later, the DLA added.

*Tantalum minerals:* 205 000lb was awarded to Kamco Metals on December 8th 2000, following the offering postponed to November 9th. Again, a date for further offerings would be announced later.

*Tantalum oxide:* The offering projected for January 25th 2001 has been delayed until March. On March 1st the DLA announced the offer of 20 000lb tantalum oxide on March 29th 2001 at 2.30p.m. If all the material is not sold, there will be subsequent offerings on the third Thursday of each month.

## EUROMETAUX

Eurometaux, the European Association of Metals, represents the European non-ferrous metals industry by maintaining an open and constructive dialogue with European authorities in all areas of policy and legislation.

Under the EU Presidency of Sweden, in the first six months of 2001, the European Commission is working particularly on environmental and health concerns. On February 13th the Commission adopted a White Paper setting out the strategy for a future Community Policy for chemicals, with the stated main objective of ensuring a high level of protection for human health and the environment while ensuring the efficient functioning of the internal market and stimulating innovation

and competitiveness in the industry.

The strategy is articulated around the following key elements, Eurometaux reports:

Reversal of responsibility from authorities to industry for the testing and risk assessment of chemicals

Introduction of an authorisation system in cases where stringent control is assured for the most dangerous substances

Increased transparency and information about chemicals (including metals)

Merge the regulatory framework for existing and new substances

Promotion of innovation and competitiveness without compromising the high level of protection.

Eurometaux advises that under the proposed scheme an industry producing a particular substance will be responsible for supplying data relative to that chemical, then the data will be evaluated and additional testing programmes will be imposed. Registration of basic information for about 30 000 substances, all existing and new substances whose production volume exceeds 1 tonne, will be required, and stringent evaluation and authorisation will follow. Eurometaux believes this will be very arduous, and that the industry should take steps urgently.

Accordingly, a Workshop will be held by Eurometaux in Brussels on May 3rd 2001 to raise awareness, assess impact on the metals industry, exchange views, and identify a response by the industry. Anyone interested in taking part should contact Eurometaux without delay: Avenue de Broqueville 12, 1150 Brussels; tel. +32 2 775 63 10; fax +32 2 779 05 23; e-mail thiran@eurometaux.be.

## MEMBER COMPANY NEWS

### Epcos

In the annual report of Siemens for 2000, Dr Heinrich v. Pierer, President and CEO, described the successful public listing of Epcos as a highlight of the year. Siemens continued to work towards sustainable improvement in profitability and to focus on increasing economic value added. It was now engaging in a 'transition into an e-company' by electronic networking and channelling data into 'one easily accessible knowledge base', establishing electronic networking with customers, and emphasising electronic processes in purchasing. A single company-wide electronic system was envisaged for all areas from research and development through production to financial reporting and human resources, and the know-how developed would be marketed to external customers as a business service. Income for the year reached a record €3.38 billion for Siemens.

Epcos is steadily expanding production capacity to meet sustained high demand, and in the first quarter of 2001 it is increasing its capacity for tantalum chips in case sizes D, V and E. The firm's data book, *Tantalum Electrolytic Capacitors*, has been completely revised.

### Sons of Gwalia

Tantalum production reached a record for the December quarter 2000 with a total of 359 570lb (Ta<sub>2</sub>O<sub>5</sub> contained), the company announced in its quarterly report. For the half year June-December 2000, the record total was 601 013lb, compared with 455 004lb in 1999. Production and sales were forecast to increase to an annual rate of 2.4 million lb by June 2003, and 2.5 million lb by June 2004. This would come from



both the Greenbushes and Wodgina Mines, with the development of the Bald Hill and Cattlin Creek satellite deposits. Both mines were exceeding their operating targets. In the last quarter of 2000 construction contracts for expansion were awarded, and expansion was proceeding on time and on budget, the company stated.

#### **Kemet**

Kemet Corporation reported record sales and earnings for the quarter ended December 31st 2000, net sales for the quarter increased by 74% over the same quarter in 1999. This was the sixth consecutive quarter with record sales and earnings, but inventory correction was expected as 2001 progressed, hence revenues for the March quarter were expected to be flat. Overall tantalum and ceramic capacitor consumption remained on a strong, long-term growth trend, said Mr Maguire, Chairman and CEO.

#### **Kemet/Australasian Gold Mines**

On February 6th 2001 Kemet and Australasian Gold Mines announced the completion of their joint venture agreement. The joint venture will own and fund the development of AGM's existing tantalum projects, and determine the feasibility of future mining and the construction of one or more additional plants at AGM sites in Western Australia and Victoria. Kemet has the right to acquire all processed tantalum products from the initial production plant, which began operations in the first quarter of 2001, as well as from any future processing operations. Kemet 'anticipates that, once full scale mining operations are achieved, production from this joint venture may ultimately provide up to 10 to 15% of its total annual tantalum requirements'. Both companies pronounced themselves excited and looking forward to this new opportunity.

#### **Kennametal**

In its Annual Report 2000, Kennametal said it had 'focused on a single aspiration: to be the world's premier tooling solutions supplier'. Worldwide restructuring of core businesses was nearing completion, and supply chain improvements were producing better service to customers. Profitability and balance sheet had significantly improved, as the company delivered 'technically superior products of high and uniform quality' supported by excellent application expertise.

#### **Alfred H. Knight**

According to Metal Bulletin, Knight has formed a joint venture with Lakefield Research to offer environmental and geochemical analysis and on-site technical services to mining, initially operating in Chile.

#### **Mamoré Mineração e Metalurgia**

Please note the following new telephone and fax numbers:  
Tel.: +55 11 4131 1172, extension 248 for the Commercial Department  
Fax: + 55 11 4131 1493

#### **Metallurg**

The fax number for Metallurg International Resources is +1 212 687 9622.

#### **Pacific Ores Metals & Chemicals**

On December 7th 2000 the General Manager of Pacific Ores Metals & Chemicals was found murdered in the company's office. The Hong Kong police believe the motive was concerned with business outside the firm. It has now been

established that the victim was secretly running other businesses on the side; investigations are continuing.

Mr Crawley, greatly shaken, advises everyone to exercise the greatest vigilance in establishing business contacts.

#### **Showa Cabot Supermetals**

Showa Cabot Supermetals K.K. is developing a web site to inform interested companies and individuals about its products and capabilities. The address is <http://www.scsm.co.jp>.

On January 25th 2001, Showa Cabot Supermetals announced an expansion in its production capacity for capacitor grade tantalum powder, 'to meet brisk demand for the product for use in cellular phones and mobile terminals/personal digital assistants'. Work on the expansion began at the Higashinagahara Plant in Fukushima Prefecture in 1999. A new powder adjustment plant was finished in October 2000, and the completion of the expansion was foreseen for April 2001 when a new plant for the reduction process which precedes powder adjustment would be started up. Research and Development facilities were also being improved. SCSM, a joint venture of Showa Denko K.K. and Cabot Corporation, expected 'double-digit growth' in the demand for tantalum powder to continue, particularly for the high-CV powder where SCSM was the market leader. In addition to its grades of 40-50 000CV, the company started volume production and sale of 70-80 000CV grades in 2000, and was undertaking trial manufacture of grades in the range as high as 100-120 000CV. Its researchers are investigating powders of 150-200 000CV.

For its raw materials, SCSM was developing new tantalum mines in Southern Africa in co-operation with local mining companies, it said, among other sources.

#### **H.C. Starck GmbH & Co KG**

Dr Axel Hoppe has been promoted to General Manager Production and Engineering of the H.C. Starck group with effect from January 1st 2001. Dr Hoppe remains the HCST delegate to the T.I.C. and a member of the Executive Committee.

#### **Vacuum Metallurgical Co., Ltd**

VMC continues to respond to present market demands with developing technologies which contribute to a global environment. A bright new booklet illustrates its various divisions: Thin-Film Materials Technology with sputtering target and evaporation source material, High Performance Materials, with refractive and reactive metals, products and services, Nano Particles Technology, and Precious Surface Treatment Technology. The company also offers custom designed equipment and products for advanced technology requirements.