

The eternal temptation of tantalum, Alkane and MDN lead the pack

☒ One hears a lot more about Tantalum than is actually going on in the metal. It seems to be always promising to become a mining sub-space of relevance and yet never get there. This is maybe not too surprising as the words “tantalise” and Tantalum come from the same mythological roots for Tantalus was a Greek mythological figure, most famous for his eternal punishment in Tartarus. He was made to stand in a pool of water beneath a fruit tree with low branches, with the fruit ever eluding his grasp, and the water always receding before he could take a drink.

On the more practical side Tantalum is a chemical element with the symbol Ta and atomic number 73. It is a rare, hard, blue-gray, lustrous transition metal that is highly corrosion-resistant. Tantalum is estimated to make up about 1 to 2 ppm of the Earth’s crust by weight. Tantalum, always together with the chemically similar niobium, occurs in the minerals tantalite, columbite and coltan (a mix of columbite and tantalite).

Applications – A Very High-Tech Metal

Tantalum is part of the refractory metals group, which are widely used as minor components in alloys. The chemical inertness of tantalum makes it a valuable substance for laboratory equipment and a substitute for platinum. Tantalum is also used for medical implants and bone repair. Its main use today is in tantalum capacitors in electronic equipment such as mobile phones, DVD players, video game systems and computers.

One could almost argue that it is like some of the rarer REEs

and Scandium in that further applications are restricted because of supply issues, not by human ingenuity. For this reason the current squeeze on supply by the implementation of anti-Conflict Mineral measures just makes the metal even tougher to source.

As can be seen from the price chart, the metal went for an almighty run and then crashed back to earth.



It is estimated that there are less than 50 years left of tantalum resources, based on extraction at current rates, demonstrating the need for increased recycling.

The intriguing thing about Tantalum is its fluctuating supply. The chart below shows supply over recent decades and it's been a wild ride. This irregularity of supply also gives a good reason why inventors of applications may be wary of creating some new usage that cannot then be supplied.



Source: USGS

Supply Sources

So we have a swathe of quasi-artisanal sources in Africa and secondary by-product sources make up much of the rest of global supply. Some of this by-product flow comes from the large-scale producers of niobium, CMM (in Brazil) and Niobec (in Canada), with the ore at these mines also yielding a small percentage of tantalum. Tantalum is also produced in Thailand and Malaysia as a by-product of the tin mining there. The slag from the tin smelters then contains economically useful amounts of tantalum, which is leached from the slag.



I always like to highlight the US strategic position in a

given metal and at least according to the USGS, the US position in Tantalum is feeble to non-existent, and yet it is one of the biggest users (1.2mn lbs in 2011). No significant U.S. tantalum mine production has been reported since 1959. US domestic tantalum resources are of low grade, some mineralogically complex, and most are not commercially recoverable. Despite this the strategic stockpiles are reportedly insignificant as well.

Conflict Metals

As can be seen by the pie chart showing sources of current production there is a heavy preponderance towards Africa as a supply source with a very high proportion of production emanating from those hot-spots of the last 20 years, the DRC, Burundi and Rwanda. Mozambique is not respectable but for a long time was riven by civil war and Nigeria has been an on-again, off-again trouble spot currently tormented by the Boko Haram movement. This puts the vast majority of tantalum production in the category of conflict minerals.

It seems that the current definition of Conflict Metals is limited to just tantalum, tin, tungsten and gold. However in our view it could be widened to include all metals that come out of zones where conflict is present and in some ways the trafficking in those metals funds the conflict. Using this as the definition then Antimony, for instance, which comes from the areas of tribal separatists in Upper Burma and is then smuggled across to China, where it makes up a significant part of Chinese dominance in this metal could also be called a conflict metal. Using this criteria it is then a fine line to draw in also the whole area of "exploitation minerals" which in quite a few cases includes artisanal mining where dubious middle-men are involved. If there was a crackdown on exploitation of the artisanal sector globally, then the party most likely to be negatively effected would be the Chinese.

Tantalum Mining Corp. of Canada (Tanco)

It is worth mentioning that the “major” producer of Tantalum in North America at the moment is the Tanco Mine, owned by Tantalum Mining Corp. of Canada (Tanco), a subsidiary of Cabot Corp. This is an underground cesium and tantalum mine on the North West shore of Bernic Lake, Manitoba, Canada. The pegmatite ore body was discovered in the late 1920s and the first mining started in 1929. Several times the mine was closed, reopened and closed, until in 1969 when it was reopened as a tantalum mine. Cabot Corporation bought the mine in 1993, and began the production of cesium brine from pollucite in 1996. The mine has the largest known deposit of pollucite and is also the world’s largest producer of cesium. Cesium is an interesting mineral in itself for its use as a drill-bit lubricant, however, I cannot find anything in the way of statistics on how much Tantalum Cabot actually produces.

MDN Inc. – the Main Play in Canada

This Quebec-based company MDN Inc. (TSXV: MDN), which many refer to as “MDN Mines”, has two specialty metals projects in the province and one gold prospect in Tanzania. Of most interest (and most advanced) is the Crevier Tantalum/Niobium project in Quebec. Interestingly this project is owned 72.5% by MDN and 27.5% by IAMgold. The latter of course owns the massive Niobec, Niobium mine in Quebec that is the largest producer of this metal outside of Brazil.

The Crevier project is located in Crevier Township 50 kilometers north of Girardville, in the Lac Saint-Jean region, Québec and covers 83 contiguous concessions covering a total of 4,645 hectares.

SOQUEM discovered the deposit in 1975 and after completing a number of exploration phases, transferred the property to Cambior in 1986, when SOQUEM’s assets were privatized. IAMgold acquired the property in 2006 with its takeover of Cambior, and Les Minéraux Crevier Inc. became sole owner in

April 2008

The property comprises a nepheline syenite dyke exhibiting pegmatitic texture that stretches more than three kilometers. It hosts a niobium and tantalum mineralization estimated at 25.8 million metric tons of mineralization.



A preliminary economic assessment conducted in 2009 by Met-Chem, an independent engineering firm confirmed the economic viability of the project. The plan considered both open pit and underground but dismissed the latter as a viable option. The resulting engineered pit recovers 25.8 Mt (or 98.3%) of the economic pit resources and increases the waste to ore ratio to 6.4 (10% increase) due to placement of the main ramps. A 25 year mine plan was developed from the pit design based on a production rate of about one million tpa of ore, an external dilution factor of 5% (at zero grade) and a mineable recovery factor of 95% for uncontrollable losses during mining.

At a production rate of 4,000 metric tons per day, the PEA estimated that the project could generate an average annual income of \$125 million. Based on an approximate investment of \$316 million, gross annual profits are estimated at \$57 million, for a net present value before taxes of \$272 million at 5%. As with so many specialty metals investments the big challenge is getting over the hump of funding the capex. At this time \$316mn is a sizeable chunk.

Australian Names

The interesting thing to note from the USGS writeup on Tantalum (which is one of their thinner offerings) is that the country with the known largest resource of the metal is Australia (listed as having reserves of 62,000 tonnes, though only 29,000 is JORC-compliant) but currently there is no

production out of the country.

The truth is that Australia is an on-again off-again producer. The largest producer, Global Advanced Metals was formerly known as Talison Minerals and owns two mines in Western Australia, Greenbushes in the Southwest and Wodgina in the Pilbara region. Wodgina produces a primary tantalum concentrate which is further upgraded at the Greenbushes operation before being sold to customers. It might be noted that the lithium part of Talison had merged with Salares Lithium and was taken over by the Chinese last year for over \$820mn.

The Wodgina mine was reopened in January 2011 after mining at the site was suspended in late-2008 due to the global financial crisis. Less than a year after it reopened, Global Advanced Metals announced that due to again "... softening tantalum demand ...", and other factors, tantalum mining operations were to cease at the end of February 2012.

Having said that, there are quite a flock of ASX-wannabes. First amongst them being Alkane Resources Ltd. (ASX: ALK | OTCQX: ANLKY) on which I have written before with their all-things-to-all-men deposit at Dubbo which is Zircon, Rare Earths, Niobium and Tantalum. Globe Metals & Mining (ASX: GBE) has a Niobium/Tantalum deposit in Malawi while Gippsland (ASX: GIP) has its Abu Dabbab Tantalum-Tin-Feldspar deposit is located within the Central Eastern Desert in Egypt. Galaxy Resources (ASX: GXY) the troubled lithium producer in Western Australia has a Tantalum resource at its Mt Cattlin mine and was, back in 2011, delivering Tantalum under its five-year sales agreement with Global Advanced Metals. However it is not clear with Mt Cattlin's problems whether this flow has been interrupted or not.



Commerce Resources – Chasing Other Metals

In its attempt to be all things to all people Commerce has lost the initial interest we had in its Blue River Tantalum project. With the onset of the rare Earth boomlet it put Tantalum on the backburner and pushed its Ashram Rare Earth prospect instead. Frankly you will need to waste a long time before you see me don a loincloth and murmur a mantra in an ashram..

The most promising aspect of the Blue River Tantalum Niobium prospect is known as Upper Fir. A PEA study by AMEC published back in 2011 estimated a positive cash flow for a potential 7,500 tpd underground operation at the Upper Fir, with cash costs of CAD\$24.91 per kilogram of tantalum metal (net of niobium metal credits) in a technical grade oxide product.

AMEC's economic evaluation was based on the September 29, 2011 mineral resource base of 36.4 million tonnes of Indicated mineral resource containing 195 ppm (gpt) Ta_2O_5 and 1,700 ppm (gpt) Nb_2O_5 plus 6.4 million tonnes of Inferred mineral resource containing 199 ppm (gpt) Ta_2O_5 and 1890 ppm (gpt) Nb_2O_5 .

However with an NPV of a mere \$18.5mn at a 8% discount rate on a whopping \$379mn CapEx bill, we can see why Commerce were easily distracted by the beads and mirrors of the Ashram!

Conclusion

So Tantalum is tantalizingly scarce both as a metal and as an investable option. While investors have a choice of number of companies with deposits, those with production are a distinctly rare commodity. Alkane and MDN look like the most likely producers, unless Galaxy stages a Lazarus-like revival from the dead.

Niobium – In the Grip of the Brazilians

Niobium (Nb) is another metal that is scarcely the word on everyone's lips as the main listed exposure to it is via the Niobec subsidiary of Iamgold (IAG) which operates in Quebec.

There are only three producing Niobium mines in the world. Despite Quebec's role for IAG, the real player is Brazil, the world's largest producer of niobium (92%), followed by Canada.



Brazil has two of the largest niobium deposits in the world, the Araxá and the Catalão deposits. The Araxá mine is operated by CBMM, where decreasing grades are increasing operating costs at the mine. CBMM is owned by the Moreira Salles family, one of Brazil's wealthiest groups. Their fortune has largely derived from a punt on Niobium back in the 1960s and interests in the banking sector. According to Bloomberg, CBMM generates more than \$600 million in annual profit. They calculated it was worth at least \$13 billion, based on the family's sale of a 30% stake to a group of Asian steelmakers for \$3.9 billion in 2011. The brothers are estimated to hold an equal share of the remaining 70% stake.



The Catalão mine in the state of Goiás is owned by Anglo American Brazil. It has the smallest reserves of the three Niobium "majors". There has been speculation that the mine may run out of ore if the deposit size cannot be increased.

Niobium – Uses and Dynamics

Niobium is an alloying agent which, when added to steel, creates a material with substantial benefits in the production of high grade steel. Steel containing niobium has many

properties making it stronger, lighter in weight and highly resistant to corrosion. Adding niobium to steel also creates steel with a higher melting point. Ferroniobium (66% Niobium, 34% Iron) represents over 90% of world niobium production. Molybdenum and vanadium can be substituted for niobium in some applications, but a performance or cost penalty may outweigh substitution. For many applications, such as some super alloys and oil and gas pipelines, there are no substitutes for niobium as the niobium allows for withstanding extreme pressures.



Niobium demand has increased on average 10% a year for the past decade, with growth forecast to continue in similar fashion in the coming decade. The global market is estimated to reach 180,000 – 200,000 tpa by 2018 – 2020 while supply is expected to be a maximum of 170,000 tpa.

Niobium prices have increased in line with this growth over the last decade. The chart at the left shows recent prices but to put that in context the price was US\$44-45 back in mid-2011 so prices have only eased off 10% over what has been a pretty tough time for the steel industry.

Interestingly it ranks sixth of the BGS survey of Critical Metals, one place behind Rare Earths in criticality of supply.

NioCorp: NioCorp is one of the lucky ones that exited the REE space early. Its earlier manifestation had been as Quantum Rare Earths (ironically exploring the same deposit as now but with a focus on REEs. Besides its sizeable Niobium resource, one of the interesting features of Niocorp is that the company is headed up by Mark Smith, the veteran CEO of Molycorp, who has been steeped in the world of specialty metals for many decades. Indeed the Elk Creek property of Niocorp used to belong to Molycorp when it was a much more diversified metals explorer, before it narrowed down to its current REE focus.

Niocorp's exploration efforts are focused on the Elk Creek Carbonatite in Nebraska. This structure is one that has intruded into the older Precambrian granitic and metamorphic basement rocks. The Elk Creek Carbonatite and Precambrian rocks are unconformably overlain by layer of roughly 200 m of Palaeozoic marine sedimentary rocks. The Elk Creek Carbonatite has been identified as a carbonatite since its discovery in 1971 through drilling.

In April 2012, QRE released an NI43-101 Resource estimate prepared by Wardrop Tetrattech. The main findings were:



With a resource of this size in a strategic metal AND located in the United States, we have pondered who might want to make a move on this company. Formerly the obvious candidate was Molycorp, now significantly less so. Surely Japanese and Korean steel makers would like to see an alternative source of supply to the Brazilians, while the US resource security hawks would be happy to see a Niobium source within the US (but they have proven less amenable to paying to develop such sources in the recent past).

The attraction for us at NioCorp is the Nb content. Another carbonatite with REE does nothing for us, and clearly the management at Quantum Rare Earth did the right thing in exiting from the dead-zone that is Rare Earths. The new leadership knows Niobium from the inside out and this is a big feather in the cap for the company.

Alkane – an example to emulate? In July, Alkane Resources Ltd, the ASX-listed Zirconia (and REE) focused explorer announced that it had signed a Joint Venture Framework Agreement with the Austrian specialty metals major, Treibacher Industrie AG, with a view to developing the company's potential stream of ferro-niobium from the Dubbo Zirconia project (DZP). This deal was a breakthrough as the company had previously announced a

MoU back in October 2011. As with most such MOUs the market loses interest after such a long gestation of a deal. Therefore when the final deal came through it acted as a substantial kicker for the Alkane stock price. The purpose in mentioning Alkane's progress here is twofold. Firstly it shows that new parties can break into the Niobium space and secondly that securing a credible partner (in this case a trading house) can be a major kickstart for a stock price revaluation.

The intended Joint Venture activities are the production and marketing of ferro-niobium (FeNb) using niobium concentrate from the DZP. The parties will form a company, initially wholly owned by Alkane, to use Triebacher's proprietary technology to process DZP niobium concentrate at a facility in Australia (or other agreed location) to produce FeNb. Triebacher has the option to purchase 50% of the new company within three years of commissioning of the plant and will have exclusive rights to market the FeNb.

The Joint Venture expects to produce over 3,000 tonnes of FeNb, utilising all of the niobium concentrate produced from the one million tonnes per annum development of the DZP, making it the only producer of niobium in Australia once production commences in 2016. At current prices, annual production of FeNb will generate revenue of approximately US\$90 million with AZL's share estimated to be about A\$80 million (depending upon A\$/US\$ exchange rate), which is 16% of total anticipated annual project revenue as determined by the definitive feasibility study released to the ASX in April 2013).

The EIS for DZP was lodged with the NSW Department of Planning and Infrastructure in late June 2013 marking the start of the approval process for this State Significant Project.

Niobec (Iamgold – IAG): The Niobec mine located in the Municipality of St-Honoré in the Saguenay-Lac-Saint-Jean region, 200 kilometers North of Québec city, is the only

underground niobium mine in the world. Niobec currently employs more than 480 employees. Its production currently corresponds of 8 – 10 % of the worldwide volume of niobium depending on changes in supply and demand from year to year.

Talk in 2012 indicated that IAG intended to float this off in the public markets but they seem to be hanging onto it. This may be because of weak markets but we would also suspect it is because Niobium currently has a better outlook than Iamgold's staple metal, gold. If the spin-off had gone ahead it would have given the metal a much stronger public awareness than hitherto where it has just been a bonanza earner for IAG hidden in its closet.

Conclusion: Mining markets scarcely know anything about the Niobium scene. This is no surprise as the exposure for investors is via roundabout routes with the current producers either embedded in majors (two in gold companies) and the biggest player is not even a public company. However the scope exists for at least a couple of other producers to surface and make a more rounded supply situation in this important metal for specialist alloy applications. As we have pointed out here, Alkane looks a likely producer in the near future and Niocorp has potential to join in at a later date thus diversifying the geographical sources (by adding Australia and the USA to the mix) and in the case of Niocorp providing the US with some resource security in the metal.