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Critical raw materials for the EU - Report of the Ad-hoc Working Group on defining critical raw materials

The Tantalum-Niobium International Study Center (T.I.C.) has received a copy of the recently published report *'Critical raw materials for the EU'*. We commend the Working Group for their efforts in producing this very useful study, and concur with many of its conclusions, but would like to take this opportunity of submitting several comments primarily related to tantalum and niobium during this period of open consultation.

Introduction: The report highlights the relative inelasticity of the mining industry, and the long lead times required to bring a new mine into production, and the resultant risk of the occurrence of crises, citing the 2000 'rush for tantalum' as an example. While there was undoubtedly an apparent tantalum shortage, the causes were more complex than indicated with the lack of industrial mine production being a minor factor: indeed artisanal production ramped up quite rapidly to fill an apparent need.

Geological and Technical Availability: We concur with the basic conclusion "that geological scarcity [of tantalum and niobium] is not an issue for determining the criticality of raw materials in the time horizon considered in this study". We are also pleased to note that the Group accepts a relatively wide definition of 'resources', and consider not just 'reserves' in your determination. The differences can be highlighted in the case of tantalum 'reserves' and 'likely resources' in Central Africa. A recent paper notes that while the former is less than 1 million pounds contained Ta2O5, the 'likely resource' is well over 50 million pounds Indeed in this case it is the resource, not the reserve that is actually mined!

While we accept that Figure 4 is developed from other workers, we were surprised to note that Ta and Niobium are regarded as 'costly' co-elements of tin, as they report to tin slag during the smelting process, often in sufficient quantities for the slag to have economic value. Indeed for many years tin slags were the primary source of tantalum, and to this day account for in excess of 10% of tantalum production. As such we would see them more as a valuable rather than a costly co-product. Likewise, columbite-tantalite –of which only a relatively small portion finishes up in tin slag - accounts for

less than 5% of all the niobium produced in the world. For niobium the most prominent source are pyrochlore reserves, not the columbite-tantalite.

THE CRITICAL LIST

Both tantalum and niobium appear on the critical list: as the dynamics placing them on the list are different we will respond for each material separately

Tantalum

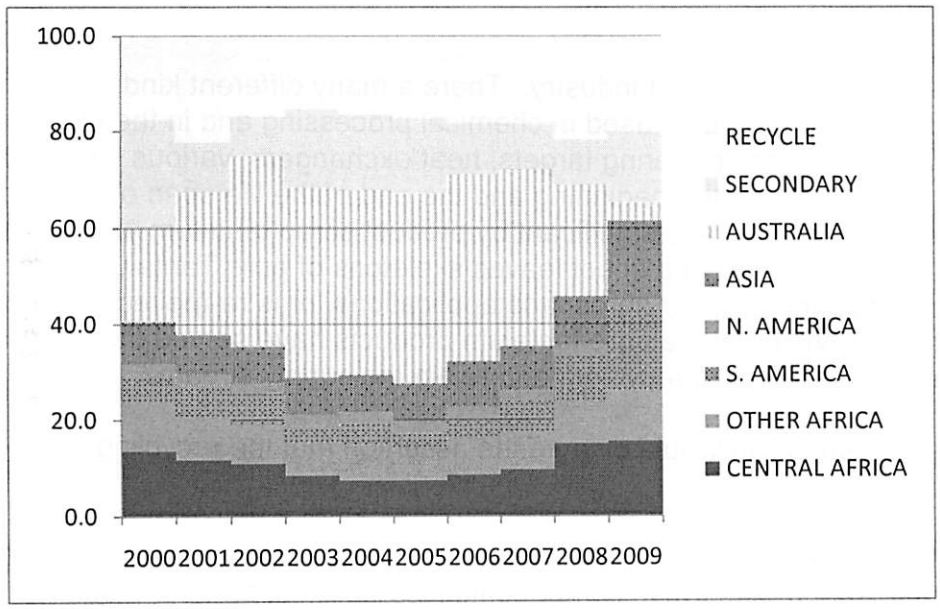
We note the report highlights three reasons for tantalum being on the critical list:

- large share of production in DRC
- recycling is limited
- difficult to substitute and where there are possibilities there may be a loss of performance.

First point - DRC: We concur that there IS the potential of a vibrant, legitimate, tantalum industry in the DRC, but not in 2010– not for technical or economic reasons, but for sociological reasons. With the ongoing unrest in the main tantalum producing areas in eastern DRC there is very little trade of 'legitimate' material at present: an issue which the iTSCi and BRG projects (see below) are seeking to clarify.

Furthermore, the report states (p32) that 'the Group decided to base its analysis on current figures' and then cites –in the table on p78 – that in 2009 less than 10% of tantalum came from the DRC with a similar amount from Rwanda: 18% in total. While the T.I.C. does collect statistics from its membership, the information is sent to an independent auditor and we receive only an holistic figure. Consequently, the T.I.C. cannot confirm, or otherwise, this figure. However, several of our members with close knowledge of the market have provided their best estimates over the years, and based upon these, we would be able to concur with the 2009 figures for Central Africa, even though the data for the rest of the world appears too simplified. While figures for 2009 Central Africa production are actually higher than for most of the last decade, as shown below, we would not classify them as either a 'large share' or indeed an essential element of long term world supply, as this apparent <u>percentage</u> increase (which will be higher again in 2010) is primarily a result of temporary mine closures in Australia, Canada and Mozambique, rather than increased central African production

Sources of tantalum 2000-2009 by percentage
Best estimates based on collated data from various industry sources



The 'Asian' production – primarily in China – is all consumed internally, and China remains a net importer of tantalum concentrates. We accept that currently there is no production in the EU, although there are resources in Finland, Greenland, Ireland and Spain (at least).

Second point – recycling: The production of tantalum capacitors involves several stages of production. At each stage the producers test for electronic characteristics such as leakage. Units that fail these tests are rejected. The rejection rate varies with the type of capacitor made, but a 20% rejection rate for critical units would not be unusual. Every pound of tantalum that is rejected from capacitor production is fully recycled and finds its way back into the supply stream.

A significant percentage of tantalum capacitors in finished electronic devices such as cell phones and personal computers are also recycled. These devices are collected in the West and send to Asia where they are dismantled by hand. The operators remove all components that contain precious metals, including all the tantalum capacitors. These are in turn processed and the recovered tantalum metal is resold on the open market. The amount of material recovered is difficult to calculate because this type of recycling is highly decentralized. We estimate that at least 50,000 lbs of Ta metal are recovered this way each year.

tantalum is a critical component in hard metal carbide mining and cutting tools. The percentage of Ta in cutting tools varies between 3% to 6%. When a cutting tool is

exhausted it is not thrown away, but put aside and stored. There are dozens of companies that specialize in collecting these used cutting tools from both small machine shops and large manufacturing plants all over the globe, and recovering the constituents which include tantalum, tungsten and cobalt. Because of the value of scrap tools, a very high percentage of all cutting tool manufactured are recycled worldwide.

Finally, there is the mill product industry. There a many different kinds of pure tantalum and alloyed tantalum products used in chemical processing and in the electronics industry. These include sputtering targets, heat exchangers, various kinds of tubing etc. Recycling occurs at both the beginning and the end of the life span of these products. The producers normally have significant by product scrap tantalum. For example a product that is stamped from a sheet leaves skeletons of pure Tantalum scrap. This is sold to the melting industry for aerospace applications, or is re-melted in electron beam furnaces. When these pure tantalum products have served their normal life they are, in turn, sold as scrap to recyclers and rejoin the supply stream.

For all these reasons, we would dispute the assertion that the recycling of tantalum is limited.

Third point – Substitution: As a result of the 2000 price spike, there is little doubt that substitution at least of electronic components incorporating tantalum took place where practical. Consequently electronic components containing tantalum – which account for over 50% of tantalum usage – are probably close to being 'unsubstitutable'; exactly as the report concludes.

However, we believe the argument is flawed. The calculations that result in a numerical figure for 'supply risk' are very strongly impacted by the aggregation of the term δ, being an estimate of the substitutability of a material in each of its uses – the higher the number, the lower the substitutability, and consequently the probability of the material reaching the critical threshold, where substitution is actively 'encouraged'.

Accepting that industry – be it the tantalum industry or any other - is 'profit driven' it is surely reasonable to presume that substitution of higher cost, less readily available materials with lower cost easily obtainable materials has already taken place. *Hence the higher the probability that the material is 'unsubstitutable' (and hence 'critical') the less likely that a Company will carry out very expensive or time consuming research in the diminishing hope of developing the substitute: this research would therefore have to be Government Sponsored. [not sure about including this sentence*

This has almost certainly resulted in tantalum making it onto the critical material list (but only just - we note that next to cobalt it has the lowest 'supply risk' factor of all those on the critical list).

Niobium

We note the difference in definition between 'strategic' and 'critical'.

Niobium apparently makes it to the critical list for two reasons:

- there is no production in the EU. More than 92% of niobium is produced in Brazil, and 7% in Canada
- the estimated recycled share of the total consumption is 20%. Although substitution of niobium is possible, it may involve higher costs and/or a loss in performance.

Point 1 - Concentration of supply. Niobium mine production is undoubtedly concentrated, with one Company CBMM currently accounting for over 70% of world production: however their Brazilian resource is vast and is of high grade and as such it is the true 'low-cost' producer. While it will undoubtedly be the cornerstone of the niobium industry for decades, there are also many other resources, in Australia, Canada, the DRC, Greenland and Saudi Arabia for example that could be mined, albeit at higher cost. Whether this concentration of production in a highly efficient low cost fully integrated Brazilian mine and processor that can supply the whole world's requirements classifies it as a supply risk seems therefore to us as debatable.
End users of niobium and niobium products are doubtless aware that CBMM is the leading supplier: that niobium usage nevertheless increases annually is testament to the fact that industry is not particularly concerned with this situation – indeed what industry would happily stop using the lowest cost, readily available material, let alone consider its substitution, just because there IS such a supplier. In fact, the opposite – the stability it brings to the industry is the very reason for its dynamic growth: a growth that CBMM can certainly continue to mirror as required.

Certainly, in the time frame of the Group's report – and well beyond - niobium is probably one of the 'safest' of all materials in terms of supply: the very opposite of 'critical'!

Point 2 – Recycling and substitution. The majority of niobium is used in the steel industry. –That a large proportion of steel is recycled is well documented; hence this must also apply to niobium.

In terms of substitution, we concur that "...substitution of niobium is possible, it may involve higher costs and/or a loss in performance" The properties of many Niobium containing steels can be substantially achieved using alternative and very well-documented alloying technology, involving elements such as V, Ti, Mn and Mo. Much of the success of niobium has arisen through CBMM promoting niobium as a cheaper and technologically superior way to achieve the properties, including through sponsoring many research projects. The progress of niobium has not "deleted" the knowledge of the use of the other elements; the knowledge is still there in the unlikely event of niobium supplies being curtailed. Therefore, while there are well known substitutes for niobium in steel industry rightly prefers to use both the best and the cheapest alternative – niobium. Why, therefore, is substitution claimed to be one of the reasons niobium is on the critical list?

THE RECOMMENDATIONS

We wish to comment on two of the recommendations.

Recommendation 4:
It is good to see the recommendations regarding the promotion of exploration and mineral processing, and the need for the development of a more streamlined permitting process. Timeliness in the permitting process, security of tenure thereafter are of vital importance for a vibrant mining industry.

In addition, free-market access to the mined product(s), is vitally important. Political interference with such trade will indeed harm industry; the mining industry generally deplores such interference and tends to seek new resources in more 'market friendly' economies.

We therefore applaud the positive approach to the emotive subject of *"promoting good governance, capacity-building and transparency in relation to the extractive industries in developing countries, notably in the area of critical raw materials"*. We are sure that the Group is well aware of the considerable efforts that are currently under way on this issue, especially as it relates to mining and trading in Central Africa of at least two of the defined critical materials – tantalum and tungsten. Both the United Nations and the OECD are indeed developing guidelines for due diligence – the latter organisation expects to complete its studies in September 2010. In addition the T.I.C. has joined with the tin industry (and their organisation, the ITRI) as well as the electronics and telecommunications industries (EICC/GeSI) in a pilot transparency project, iTSCi, more details of which can be found on the ITRI website. There is also a concurrent project sponsored by the BGR in both Rwanda and the DRC.

Hence, we are pleased to assure the Group that this recommendation is already being actively pursued by at least the tantalum/niobium, as well as the tin, industries.

Recommendation 7: The Group recommends that *substitution should be encouraged, notably by promoting research on substitutes for critical raw materials.* We have a serious concern with this recommendation, as we believe there has been a 'circular argument' to reach this recommendation, as indicated above. The conclusion of the working group – that: 'For many of the identified (critical) raw materials, substitution is currently difficult to achieve without a deterioration in the quality or performance of the products, or is not economically viable" would suggest that the current material is likely both the best AND the least expensive – so why would industry want to change to something less effective and more expensive: they will expect that the mining industry develops new resources of the 'best material' to meet its demands – something the mining industry has had a long history of so doing, as indicated above in the case of niobium.

Recommendation 7 is therefore of significant concern to the tantalum and niobium industry, both on the list of 'critical' materials

It is our belief that:

- The formula to compute 'supply risk' needs to be modified, such that the impact of [lack thereof] 'substitutability' is decreased significantly
- Recommendation 7 be reworded, deleting 'substitution should be encouraged' and changing the second part of the sentence to something along the lines of '...that member states consider sponsoring research into possible economic substitutes (where none now exists) for critical raw materials where long-term free-market availability of that material is deemed improbable'.

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The Tantalum-Niobium International Study Center (T.I.C.) is an international trade association comprising around 85 members, all involved in the industries of tantalum and/or niobium, at various positions along the supply chain (mining, trading, processing, manufacturing, recycling, and for end-users such as electronics, steel, medical, aerospace, etc)

Submitted on behalf of the T.I.C.

Richard Burt
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