

TANTALUM PRODUCERS INTERNATIONAL STUDY CENTER

QUARTERLY BULLETIN

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SECOND QUARTER

Each quarter the T.I.C. Bulletin will provide information covering the processing of tantalite and the applications of tantalum metal, as well as short sketches of a number of the companies who process tantalum and use tantalum products. It is intended that this type of coverage will be informative and helpful to the tantalum producer members.

Value of Columbium (Niobium) in Tantalite.

Even though the tantalum processor buys tantalites, paying only for the contained tantalum oxide, the amount of columbium oxide in the tantalite is generally very important to him. Since the chemical processing cost is almost directly related to the gross volume of ore digested, variation in the amount of columbium in the ore does not cause any change in cost. Any sale or application of the columbium, usually as a refined calcined oxide, represents mostly profit. Therefore, comparable tantalites containing different levels of columbium will have different values to the processor, the one with more columbium being worth more per pound of Ta_2O_5 .

At the present refined columbium oxide has a market value in the United States ranging from \$2.75 to \$3.15 per pound. Considering final calcining and packaging costs as well as processing losses, overhead, and profit, each pound of columbium oxide in the ore contributes about \$1.35 to its value. On this basis, a 30% tantalite containing 35% Cb_2O_5 should be worth \$0.45 per lb. of Ta_2O_5 more to processor.

Tantalum Carbide.

Tantalum carbide (TaC), sp. gr. 13.9, m.p. $3880^\circ C$, is a crystalline, very fine gold-to-brown-colored powder. Its Moh hardness is between 9 and 10. It is prepared by direct carburization of tantalum powder

or by reaction of tantalum oxide with lampblack.

The use of TaC in cutting tools is the second largest use for tantalum, probably requiring almost 1,000,000 lb. of Ta_2O_5 in ore per year. The cutting tool products containing tantalum are primarily cemented carbide inserts for steel cutting applications. Tantalum carbide is blended with tungsten carbide and milled with cobalt, granulated, pressed into desired shapes, and subsequently sintered. The sintered part is then worked to provide a ground or honed surface. The tantalum content in inserts varies from 1% to 15%, averaging about 5%. The actual use of tantalum for carbide would be much higher, but old cutting tools are recycled by pulverizing and being re-used as tungsten-tantalum carbide. About 35% of the old tools are recycled into new cutting tool manufacture; 15% into wear parts, dies, balls, mining tools and tire studs; 25% into alloy steels, synthetic scheelite, etc.; and, the balance lost in consumer handling.

There is no economic way to separate the tantalum out of the carbide complex to allow it to be used for metal applications.

Japanese Tantalum Consumption.

The Japanese New Metals Association regularly reports the consumption of tantalum in Japan. The latest data obtained follows (units in kg of contained Ta):

Product	1973	1974
	Actual	Estimated
Capacitor - Powder	65,372	73,000
- Wire	9,801	11,000
- Foil	849	870
- Other	2,535	3,000
- Total	78,557	87,870
Industrial - Powder	6,697	7,500
- Mill Products	6,729	6,500
- Carbide	41,561	40,000
- Oxide	11,230	11,000
Grand total	144,774	152,870

The fourth quarter data for 1974 was not complete at the time of reporting and is included as an estimate. In the opinion of one major processor, the fourth quarter was at about 50% of the third quarter. This lower level is expected to continue through at least the first three quarters of 1975.

Tantalum in the Chemical Industry.

Kawecki Berylco Industries Inc. (known in the industry as KBI) has recently issued a new bulletin, 312-PDI, describing the use and fabrication of tantalum products. An excerpt from it follows:

"Tantalum has many applications in the chemical process industries. As is the case with all metals, an oxide film is formed on

fluoric acid being the notable examples. This film is rectifying in nature when a current is applied thereby discouraging the formation of electrolytic cells that lead to serious corrosion failures, and it is relatively thin and therefore not a serious deterrent to good heat transfer.

Tantalum has wide application in the heating and cooling of many corrosive media. Relatively high coefficients of heat transfer ("u" value) can be used in the design of heating and cooling equipment for three main reasons:

1. Good thermal conductivity of tantalum (better than stainless steel, high temperature steel, silicon iron, nickel alloys).
2. Corrosion allowances, in tantalum metal thicknesses, are not required.
3. Non-fouling nature of tantalum.

This results in a smaller number of square feet required for the specific application which helps to offset the relative high cost of the metal.

The corrosion resistance of tantalum is often generally compared to the corrosion resistance of glass, although it will withstand

tantalum when exposed to normal atmospheric conditions. However, the effects of this film in the case of tantalum are startlingly different than with most other metals. The oxide film in itself acts as a barrier to the continuing oxidation of the metal, it is soluble in only a few corrosive media, fuming SO_3 and hydro-

higher temperatures and offers the intrinsic advantages of a metal from a fabrication standpoint. Tantalum equipment is frequently used in conjunction with glass, glass lined steel, and other nonmetallic materials of construction in chemical equipment. It is used extensively in repairing damage and flaws in glass lined steel equipment.

Heat transfer equipment constructed of tantalum includes straight tube heat exchangers, condensers, bayonet heaters, spiral coils and U-tubes. Tantalum is also used in thermocouple wells, dip pipes, orifices, valves and diaphragms and in other special areas. The leading anti-corrosion applications are in the manufacture of hydrochloric acid and hydrogen peroxide, recovery of sulphuric acid, in bromine heaters and stills, and in condensing ethyl bromide, as well as in the preparation of high-purity chemicals."

Fansteel Inc.

Fansteel, one of the larger tantalum processors, was the first commercial producer of tantalum metal in 1922. Fansteel is a diversified metal products company producing carbide cutting tools, electrical

contact points, specialized forgings and fabrications for the aero-space industry, golf clubs, and many other similar items. The Company is divided into four divisions, one of which, the Metals Division, processes tantalum and columbium into the most complete line of products of any processor.

The Division has three plants, each of which has its own function. The Muskogee, Oklahoma plant is the chemical processing and consolidation facility. Here, the ore is dissolved, the tantalum and columbium are separated, purified, and reduced to pure metal powders. Consolidation is accomplished by means of pressing and sintering or by electron-beam melting. This plant provides all of the starting products for further processing, as well as refined tantalum oxide, refined columbium oxide, and tantalum carbide for direct sales. The analytical laboratories for the Division are located here.

At North Chicago, Illinois, materials received from Muskogee are converted into a number of different finished products, sheet, foil, wire, tubing, and capacitor grade powders. The plant includes almost every type of processing equip-

ment: various types and sizes of rolling mills, heat treating furnaces, tubing and wire drawing machines, powder grading and heat treating, as well as complete electronic and mechanical testing laboratories.

The third plant, located at Torrance, California, fabricates tantalum hardware for the aerospace and chemical industries. Their products include components for rocket engines and missile guidance systems; heat exchangers, reactors, bayonet heaters, and thermowells. The plant is equipped with all types of fabricating machinery, including forming presses, tube benders, vacuum welding chambers, and assembly heat treating furnaces.

Stockpile Disposal Legislation.

Although an Omnibus Bill was introduced into the U.S. Congress last year covering the disposal of National Stockpile materials, there have not been any Committee hearings on the total bill. Three special bills covering silver, beryl, and tin are in front of the Armed Services Committee. Hearings were held in March in relation to beryl, but there has been

no further activity. Based on a newly proposed criterion that the Stockpile level of a commodity should exceed a three year consumption level in the United States in order for that commodity to be eligible for disposal, it appears unlikely that tantalum will be released. Informed sources in Washington believe that there is no possibility of any tantalite being made available for sale during 1975. Also, due to a ground swell of opinion that an Economic Stockpile

should be established covering commodities for which there is little or no production within the United States, it is believed that the tantalites now in the National Stockpile will be retained. It would seem

that there is little likelihood that any supply will be available from G.S.A. for at least a few years. The market requirements will have to be supplied from inventories and new production.

Statistics.

Tantalite concentrates production, Republic of Zaïre

1973	56,287 kg
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11 months 1974 (Jan.-Nov.)	48,053 kg
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Source : Quarterly Statistical Bulletin of
Banque du Zaïre. March. 1975.