# ANALYSIS OF TANTALUM

CHEMICAL ANALYSIS AND MINERALOGY

Since 1982, the dramatic increase in demand for tantalum has been fueled at a rate of 10% per year by the electronics industry (Roskill Information Services). This makes tantalum a high value, high tech metal, but it is characterized by a refractory nature, low natural abundance, extensive solid solution, few known deposits, sporadic supply and difficult metallurgy.

The breadth of expertise in SGS Minerals Services allows the group to repeatedly make quality sampling and testing contributions to tantalum projects involving both naturally occurring materials and industrial products.

- Determine bulk Ta composition
- Identify Ta species present and document textural relationships
- Document the chemistry of Ta minerals and related phases
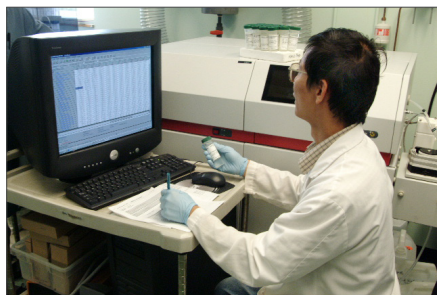
BULK COMPOSITION

EXPLORATION MATERIALS

Low-grade solids such as soils, rocks and related geochemical exploration materials are difficult to analyze by acid-digest ICP due to the refractory nature of tantalite, and XRF due to the typically low natural tantalum abundances. Our laboratories use fusion ICP-OES or fusion ICP-MS to ensure both a low detection limit and total analysis.

ORES, CONCENTRATES AND HEAVY MINERAL SEPARATES

High-grade ore and metallurgical products are readily analyzed by automated borate fusion-XRF or ICP-OES. Borate fusion-ICP-MS can be used for low levels or impurity levels as required. This allows for a highly reproducible analysis across the wide analytical range (ppm (g/t) to over 60 wt.%) needed for low grade ores as well as tantalum concentrates.

METALS AND SECONDARY FEEDS

Ta-bearing metals and secondary feeds such as electronic components are first scanned to determine bulk composition and impurities.   Depending on the requirements (impurity quantification vs. concentrate grades) and the matrix of the sample, multiacid or high pressure microwave digestion is then used, followed by AA, ICP-OES, or ICP-MS.

AUTOMATION AND RELIABILITY

SGS Minerals Services' laboratories use automated sample fusion, digestion equipment and high capacity autosamplers to introduce samples to the instruments. This results in standardized procedures, reproducible operating conditions, efficient use of time, high reliability and fast turnaround.


Setting up Automated XRD

QUALITY

Reputable labs analyze control materials to monitor their performance. Ideally, such reference materials will span both concentration range and expected sample types.

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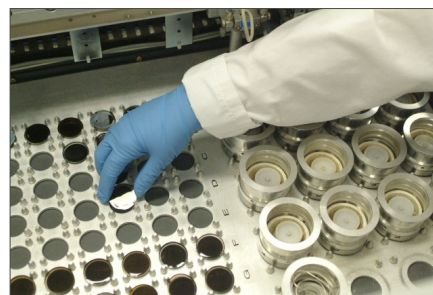
PRECISION

This control chart shows the long-term high precision that the laboratory at Lakefield has achieved on Ta. The 1σ RSD over five years is 7.3% on 173 data-sets of TAN-1 by PP-XRF.

Shewhart Chart
TAN-1 XRF [TaXRF]

Std 3
Std 2
Std 1
Mean
Std -1
Std -2
Std -3

1997   *2002*
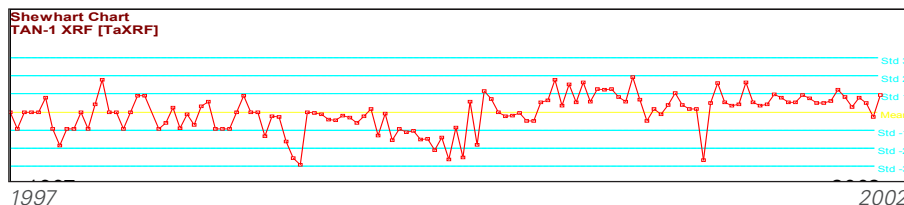
REFERENCE MATERIAL	ELEMENT	POINTS	MEAN (G/T)	SD (1σ)	ACCEPTED VALUE (G/T)	DIFFERENT AT 95% CI?
TAN-1	Ta	58	287	0.03	288	No
IGS-33	Ta	31	5.1	0.23	5.4	No
IGS-34	Ta	65	49.7	0.75	49.8	No

ACCURACY / BIAS

Ta determinations on certified reference materials analyzed at the laboratory in Lakefield show no bias at the 95% confidence level.

PROFICIENCY TESTING AND ROUND-ROBIN EXERCISES

The Group's laboratories successfully participate in performance testing programs run by government and client organizations.

MINERAL IDENTIFICATION AND TEXTURES

Identification of Ta minerals is difficult due to the extensive solid solution and complex intergrowths between Ta, Nb and Fe phases so the demarcation of Ta-rich phases is often critical. SGS Advanced Mineralogy Facilities are uniquely positioned having a wide variety of mineralogical tools to do this, including QEMSCAN electron microprobe, optical microscopy, image analysis, scanning electron microscopy and X-ray diffraction.

MINERAL CHEMISTRY

The chemical composition of Ta-bearing species can be quantified using electronic microprobe and QEM-SCAN. This equipment determines the amount of tantalum in trace phases or can highlight in environmental concerns or situations that might cause processing penalties.

QEMSCAN

Ferrotapiolite (bright white) (Fe,Mn) (Ta,Nb)2O6 has a different trace element composition (SEM spectrum) from pyrochlore and columbite, and may contain Sn, U, Th and Pb.
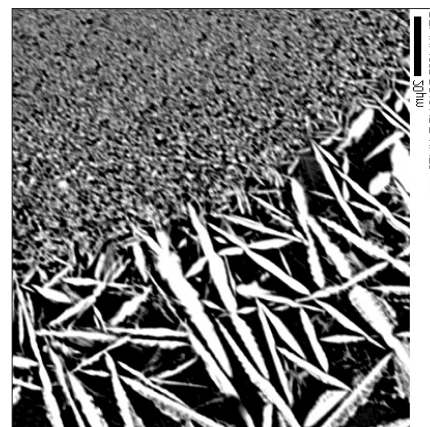
Backscattered electron image of Ta-Nb-Fe oxide with dendritic textures at margins. EDS spectra shows presence of Ta-Nb and Fe in dendrite.

CONTACT INFORMATION

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WHEN YOU NEED TO BE SURE