

TANTALUM AND NIOBIUM

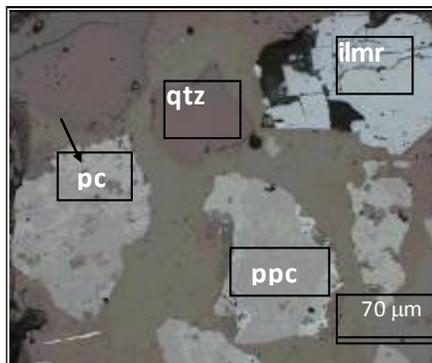
MINERALOGY & METALLURGY

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). Characterized by a low natural abundance, few known deposits, sporadic supply and difficult metallurgy, tantalum is a high tech metal of the future.

SGS Minerals Services has contributed to many tantalum projects over the years and can bring an integrated suite of services to either the exploration or developmental stages of Ta and Nb projects.

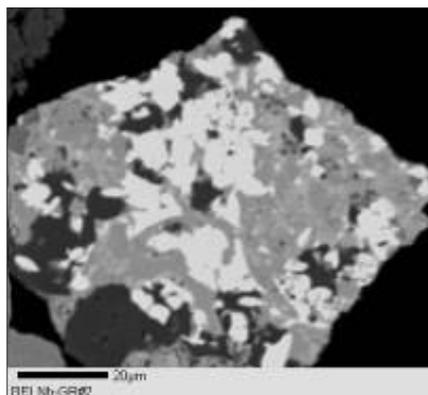
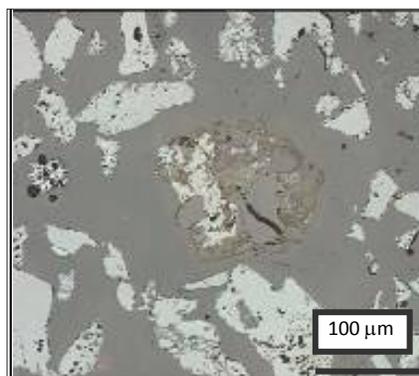
MINERALOGICAL INVESTIGATIONS

Early identification of the Ta or Nb minerals in an ore as well as their deportment, textural associations and micro-chemical composition plays a critical role in determining a deposit's amenability to metallurgical processing.



MINERAL IDENTIFICATION

Owing to the extensive solid solution between Ta, Nb and Fe, identification of Ta and Nb minerals is critical to the evaluation of mineral recovery and deposit economics. For example, the sample to the right contains intergrown plumbopyrochlore (ppc) (Pb,U,Ca)Nb₂O₆(OH), pyrochlore (pc) (Ca,Na)₂(Nb,Ta)₂O₆(OH,F) (red arrow), ilmenorutile (Ti,Nb,Fe)₃O₆ (ilmr) and quartz (qtz) gangue.



DEPORTMENT AND TEXTURE

Deportment and textural associations define liberation and locking characteristics that are crucial for metallurgical processing. For instance, the back-scattered electron image at right shows pyrochlore (white) locked with gangue minerals, implying poor liberation and recovery, and suggesting the need for regrinding.

CHEMICAL COMPOSITION

Quantification of the chemical composition assists in the elemental allocation among Ta and Nb species. It also assists in the metallurgical mass balance calculations used to optimize recovery. Deleterious elements can create environmental concerns or result in smelter penalties. In the case to the right, ferrotapiolite (bright white) (Fe,Mn)(Ta,Nb)2O6 has a different trace element composition (SEM spectrum) from pyrochlore and columbite, and can contain Sn, U, Th and Pb.

METALLURGICAL PROCESSING

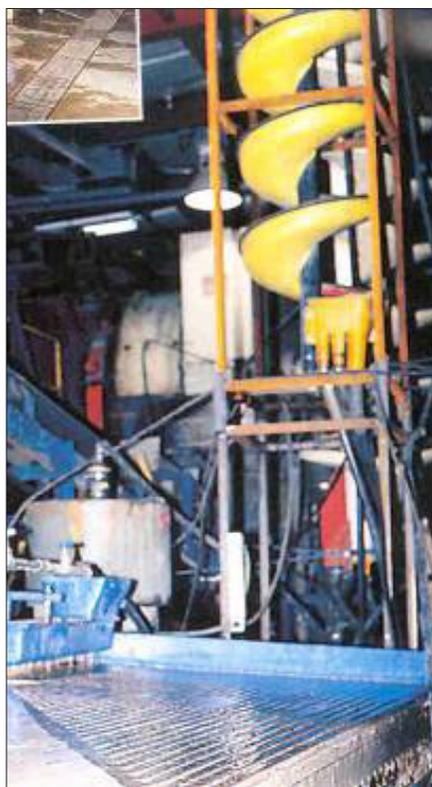
Mineralogical data provides the grain size and textural parameters needed to establish and optimize a metallurgical flowsheet. Depending on the grain size, textural associations and accessory minerals present, a variety of different separation strategies can be used to concentrate Ta and Nb minerals, including grinding, conventional and centrifugal gravity separation, regular or high intensity magnetic separation and advanced flotation techniques.

GRINDING

Proper grinding parameters ensure effective liberation. For Ta or Nb processing, it is particularly important to minimize the production of fines.

CONVENTIONAL AND CENTRIFUGAL GRAVITY SEPARATION

Ta and Nb minerals are easily separated from gangue due to their high specific gravity. SGS Minerals Services has a wide variety of bench and pilot scale gravity separation equipment available for testing.



MAGNETIC SEPARATION

Low and high intensity magnetic separation can separate Ta and Nb minerals of varying magnetic susceptibility during final up-grading. Here tantalite is being separated from quartz-calcite gangue using bench-scale high intensity magnetic separation.

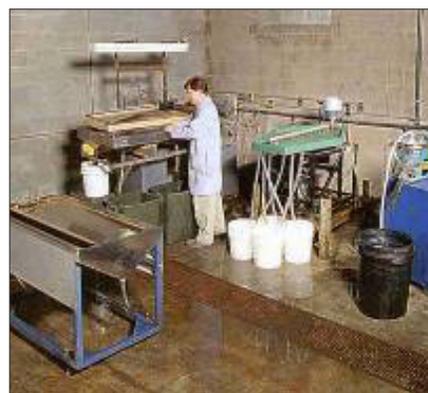


FLOTATION

SGS Minerals Services’ metallurgical group has developed new flotation reagents that yield excellent primary separations between Ta and Nb minerals and gangue. The sample to the right is a highly liberated Ta-Nb ore (pyrochlore, columbite) (bright white) with a calcite-quartz gangue (dull grey), which responded well to these reagents.

Traditional flotation technology is also used to remove or concentrate associated sulphide minerals. Reverse flotation procedures and regrinding circuits then are used to prepare final Ta or Nb concentrates.

Make the right choices for the right reasons. Mineralogical scoping studies early in a project result in efficient metallurgical bench-scale and piloting later. Maximize the return on your investment.



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