

Determination of Tantalum and Tin Ore with the Thermo Scientific Niton FXL Field X-ray Lab



Introduction

Tantalum (Ta) and tin (Sn) are widely used in high-end technological manufactured products. The aircraft industry (missiles, airplanes, nuclear industry, etc.) uses Ta for its hardness and for making high-temperature resistant materials. Sn demand is also very high, from the food industry (packaging) to electronics, where it is commonly used in solder. During 2010, the demand for Ta and Sn ore showed a very strong recovery, and it continues in 2011.

Due to the high trading values of these metals, a fast analytical tool, such as a field-portable x-ray fluorescence (XRF) analyzer, is needed from exploration to all levels of ore trading. Field-portable XRF is a technique with the ability to deliver results with little to no sample preparation in mining operations. The Thermo Scientific Niton FXL field x-ray lab allows you to get faster and more accurate results than previously possible with field testing techniques, which is increasingly important when the correct results and decisions are required quickly.

Thermo Scientific Niton FXL Field X-ray Lab

The Niton® FXL field x-ray lab couples our proven, pioneering XRF technology with true lab-quality performance. It offers our highest XRF-based performance and lowest levels of detection. You can operate the compact unit from the back of a truck, mounted on a tripod, or in your on-site lab. With easy touch-screen operation, the Niton FXL analyzer delivers fast, elemental analysis; outstanding performance, features, and mobility; and requires little operator training. This breakthrough instrument has an internal battery and is designed without compromise to operate reliably in almost any environment. It's the perfect complement to our handheld analyzers, providing a total sample testing solution.

The Niton FXL field x-ray lab provides the following key benefits:

- Faster throughput and lower detection limits for higher productivity
- Unparalleled accuracy for confident results every time
- High-performance 10-watt system for improved heavy element detection
- Lab-quality performance in a field-mobile instrument
- Waterproof, dustproof, rugged housing for harsh environments

Method

Twenty-seven previously characterized dry, rough powders were analyzed in 32 mm sample cups fitted with polypropylene film. The data quality objectives dictate the sample preparation requirements, so minimal sample preparation was required for these samples to yield the results shown here. The samples were analyzed for 90 seconds using both the main filter and high filter. In this study, iron (Fe), niobium (Nb), Ta, and Sn have been analyzed as elements (metals). The user can also display the elements as oxides, Fe_2O_3 , Nb_2O_5 , Ta_2O_5 , using our Pseudo-element feature. Note that not all of the 27 samples analyzed were supplied with values for all of the elements.

Mining Analysis calibration was used for quantification of these samples. This is a fundamental parameters (FP) model that is able to quantify more than 40 elements, typically without the requirement of user calibrations. However, when required, a simple post calibration adjustment can be made to improve accuracy using your previously characterized lab samples.

Results

Figures 1 through 4 show the correlation curves, lab results vs. the Niton FXL XRF results, for Ta, Nb, Fe, and Sn. The coefficient of determination (R^2) for each element is provided in the figures. The R^2 value is a measure of how closely the data sets correlate with each other, where a perfect correlation would have an R^2 of 1.

Comments

Results achieved using the Thermo Scientific Niton FXL field x-ray lab demonstrate excellent agreement with the lab results. Quantification of dense matrices like Sn, Ta, Nb (and more generally for matrices from Zn ($Z=30$) to Pb ($Z=82$)) require a robust calibration model like that found on the Niton FXL analyzer.

You can even “fine tune” the factory calibration using your own set of analyzed samples. This minimizes the error along the large quantified percent range.

To discuss your particular applications and performance requirements, or to schedule an on-site demonstration and see for yourself how Thermo Scientific Niton XRF analyzers can help save you time and money, please contact your local Thermo Scientific Niton Analyzer representative or contact us directly by email at niton@thermofisher.com, or visit our website at www.thermoscientific.com/niton.

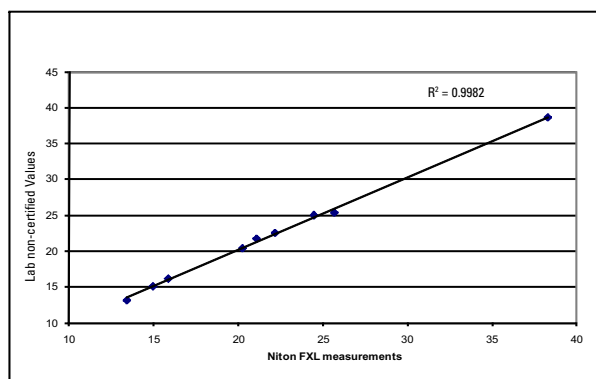


Figure 1. Correlation curve for Ta

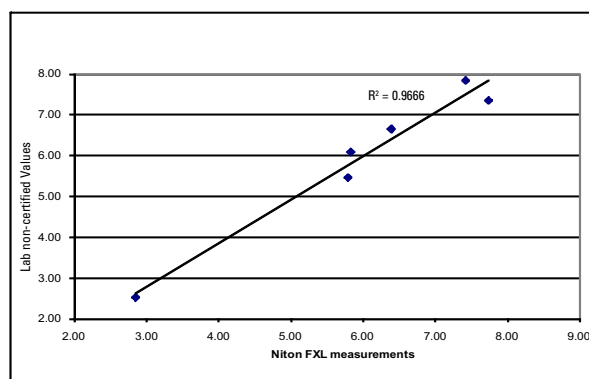


Figure 3. Correlation curve for Fe

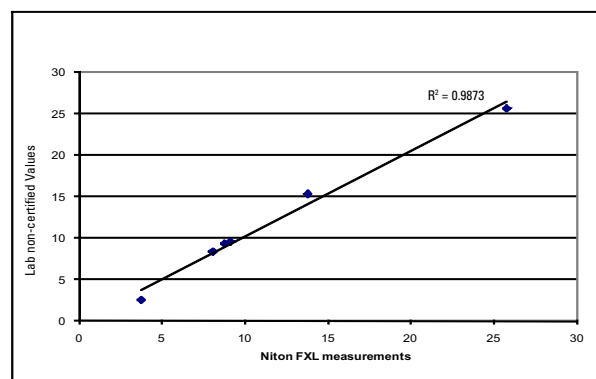


Figure 2. Correlation curve for Nb

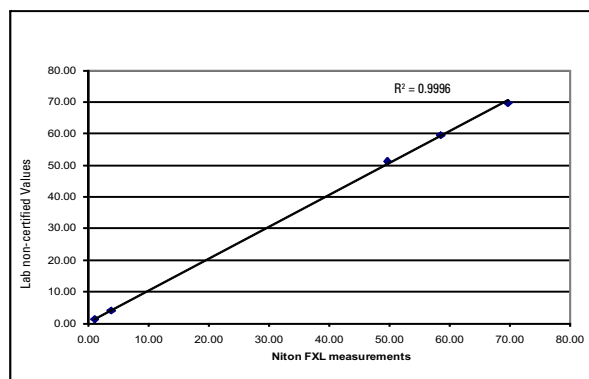


Figure 4. Correlation curve for Sn

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