



CAMECO - STANDARD SAMPLING METHODOLOGY AND PROCEDURES

Cameco

DRILL CORE SAMPLING METHODOLOGY

Samples are selected from the central part of each row of the core tray and routinely cut into 10 cm lengths halved along the core axis using a core saw (one half retained in the core-tray) and then the length is halved. One half is described using physical properties (grain-size, colour, magnetic susceptibility and friability) and measured for spectral parameters using the ASD spectrometer. These samples are retained within the Cameco storage facility in Darwin. The other half of the sample is used for geochemical analysis. Selected samples are sent for thin sectioning and petrographic description.

'COMPOSIT' samples are sample intervals where half-core is selected from each row within the core trays, and combined over a nominal 5 m interval. The intervals are determined from lithological and/or alteration boundaries by the geologist logging the hole. 'SPOT' samples are selected samples, nominally 10cm in length. 'SPLIT' samples are mineralised or anomalous intervals (generally as determined from the down-hole gamma log) and are sampled from halved core over nominal 0.5 m intervals. Duplicate samples ('REASCOMP' in Cameco database) are submitted at a nominal 1 in 20. For these samples, core is cut lengthways and adjacent 'matching' quarters are submitted for analysis. Heterogeneous core is avoided.

Drill Logging codes are summarised in the following Appendix 1.

Appendix 1: Drill Logging Codes

Analytical Methods

Core and outcrop samples are routinely submitted to Northern Territory Environmental Laboratories Pty Ltd (NTEL) in Darwin for sample preparation and multi-element analysis (G400 and G950 analyses; refer to Appendix 2 and Appendix 3). A split of each pulp was submitted to North Australian Laboratories Pty Ltd in Pine Creek for Au, Pt and Pd analysis using Fire Assay with an ICPMS or ICPOES finish (either method is suitable). In total, four separate methods were used to analyse up to 65 elements and four isotopes as follows. In the initial batches of samples, SiO₂ was also determined from a peroxide fusion digest, in order to get more accurate data than the present method of calculating silica from the other major elements and LOI. However these analyses appeared to be no more accurate than those calculated (i.e. total majors were 100% +/- 5%), so analyses for SiO₂ were abandoned.

Appendix 2: Sample preparation at NTEL analytical facility

Appendix 3: Analytical procedures used by NTEL

Prior to 2005 basement samples and sandstone samples were prepared separately by different methods. However due to problems with repeatability in the sandstone data (Garnett, 2005), a total preparation method for all samples was considered the preferred option. NTEL installed a preparation facility in early 2005 and this is now routinely used for all samples (refer [Appendix 2](#)). Basement and sandstone samples are generally still submitted in separate batches to minimise risk of contamination in

sandstone samples from the generally higher background levels of many elements in the basement samples. Sample preparation at NTEL involves initial drying at 110°C. The entire sample is crushed to a nominal 2 mm in a Boyd Crusher, then divided using a Rotary Sample Divider to give a ~300-400 g split. The split is milled in a Whisper ring mill to a nominal 75 urn. The material used on the crushing surfaces was selected to be free of contaminant trace metals (the major contaminant is iron) and this was confirmed in tests conducted by Cameco prior to submitting field samples. The Boyd Crusher is flushed with barren blue metal and the ring mills are flushed with garnet sand before and after each sample. The RSD is vacuum cleaned.

The pulp is digested using a mixed acid digest (G400 nitric, hydrochloric, perchloric and hydrofluoric) with a double dehydration with perchloric acid in a Teflon beaker. The digest is read for a suite of elements listed in Appendix 4 including total U, Th, Pb- isotopes chalcophile and rare-earth elements (REE) using either ICPMS (G400M) or ICPOES (G400I) depending on the element. LOI is measured at 1000°C. Boron is measured following peroxide fusion digest. A portion of each sample is then subject to a weak acid leach (Method G950), which is a dilute nitric acid digest. The sample is read using ICPMS for labile uranium and lead isotopes. It is important to note that with these weak partial leaches the data should not be used in an absolute sense, as the analyses are sensitive to length of time the sample is left in the digest and a small speck of uraninite in the sample will result in a very high result, that might not be repeatable and should only be used relatively as ratios.

Appendix 4: Analytical suite for Cameco samples

Reflectance Spectroscopy (PIMA)

Reflectance spectroscopy (PIMA) analysis is completed using the PIMA II short-wave infrared spectrometer on all drill core and outcrop samples collected ([Appendix 5](#)). This instrument measures the reflected energy from a sample in the short wave infrared (SWIR) region of the energy spectrum. The sampling area on the rock specimen that is measured is permanently marked. Multiple measurements are occasionally taken, particularly if variations in spectral features are noted. The spectra are converted to an ASCII format and processed using "The Spectral Geologist" (TSG) developed by [AusSpec International](#). TSG is routinely used to process all spectral data. The SWIR spectra, once processed, provide a mineral identification utilising internal software pattern matching algorithms called 'The Spectral Assistant' (TSA).

Appendix 5: PIMA and ASD methodology

ASD Reflectance Spectroscopy

Cameco purchased and begun using an Analytical Spectral Device Inc. -Terraspec instrument (ASD) for routine reflectance spectral analysis during 2005. The ASD records similar information to the Integrated Spectronics PIMA instrument, but with a wider wavelength range from the visible through to near infra-red (350nm to 2500nm). The advantage of the ASD is the speed of acquisition of the spectra; a reading every 10 seconds, and the wider spectral range. The spectra are processed using the same methodology as PIMA, with mineral matching processing using The Spectral Geologist software and The Spectral Assistant algorithms.

OUTCROP SAMPLE PROCESSING PROCEDURES

Outcrop samples are routinely divided into two approximately equal halves ([Appendix 6](#)). One half, (> 400 g) is used for geochemical analysis (see below). The remainder is used to visually estimate grain-size, friability and colour, and measure spectral parameters using the PIMA II spectrometer. This sample is retained within the Cameco storage facility in Darwin for reference, but can also be used as a repeat geochemical sample in the event of a lost or erroneous analysis. Small portions of selected samples are sent for thin sectioning, with or without petrographic description (Pontifex & Associates). Duplicate samples are submitted for geochemical analysis at a nominal 1 in 20.

[Appendix 6: Outcrop Sample Procedures](#)

REFERENCES

Garnett, D., 2005, Comments on Cameco QC and other geochemical issues, Becquerel laboratories.