PIMA REFLECTANCE SPECTROSCOPY

Background

Short wave infra-red (SWIR) reflectance spectroscopy is used to distinguish clay mineralogies is rock specimens, and is a potential way of characterising or detecting alteration haloes around ore bodies. Cameco Australia uses a PIMA II (Portable Infrared Mineral Analyser) which facilitates rapid and low-cost acquisition of reflectance spectra.

Method

Preparation

All rock samples are dried thoroughly prior to PIMA analysis, typically 2 or 3 days in sunlight. For outcrop samples and drill core, a circle approximately 2 cm in diameter is inscribed on the flat, cut surface of the rock. This marks the section of the rock to be placed on the aperture of the PIMA instrument. The circle is in indelible ink for reference purposes. Percussion chips are placed in a glass Petri dish which is then placed on the PIMA instrument.

Taking Readings

Data acquisition software, Pima SP Acquisition V2.2 by Integrated Spectronics, is installed on the PIMA II instrument. The instrument is calibrated prior to use, and the calibration fos file is saved as a reference of any instrument drift.

A typical spectral reading takes around 30 seconds. Poorer quality spectra, as indicated by the acquisition software, require repeat readings with higher integration or noise reduction. This is a slower process, but may result in higher quality spectra.

At the discretion of the geologist, more than one reading may be taken from different sections of a single surface or drill sample. This may be in order to characterise, for example, an alteration selvedge. A quality spectrum may not be obtainable for some samples, particularly those very dark in color. All final spectra are saved as fos files.

Data processing

Fos files are read by TSG (The Spectral Geologist) Professional V 4.0, software developed by AusSpec International Pty Ltd. TSG includes spectral recognition software, TSA (The Spectral Assistant) V 5.0. TSA yields up to two mineral species for each specimen, and the relative proportions of each mineral.

A custom library, using selected Cameco spectra from West Arnhem Land and the Athabasca Basin as references, provides a second possibility for spectral matching. This library was remodelled in 2005 and is still being refined.

Within TSG, several scalars are used to calculate parameters, for example AlOH crystallinity, water features, phengite features, and signal-to-noise ratios. The manner by which these parameters are calculated is described in TSG Procedures and Definitions.

All data are stored in a MS Access database.