OLYMPUS®

Your Vision, Our Future

Portable XRF for Gold (Au) and Au Pathfinders for Mineral Exploration and Ore Body Vectoring

Olympus' X-ray Fluorescence (XRF) analyzers provide high performance, real-time geochemical data for rapid multi-element characterization of soil, rocks, and ores. Recent advances in XRF technology have increased the number of elements measured, improved the limits of detection, and reduced analysis test times.

Vanta™ XRF analyzers provide convenient and rapid measurement of many types of samples associated with Au exploration, within Au mines, Au mine labs, and refined Au products.

Benefits

- XRF analysis of pathfinder elements in soil, drill cuttings, and drill cores enables rapid indication of potential Au mineralization
- XRF pre-screening enables priority sample selection for laboratory analysis, improved drill target generation, and maximization of analytical budgets
- XRF mapping of structural features and identification of alteration zones improves ore deposit understanding, modelling, and vectoring; the result can be less dilution and better Au recovery
- Use of XRF for litho-geochemistry applications and rock typing enables rapid and inexpensive lithological classification of samples

Deposit Type	Geochemical Signature
Orogenic Au	S, As, CO_2, K+/– Sb, Te, Mo, W, Cu, Pb, Zn, Hg
High Sulfidation Epithermal	Ag, Cu, Te, Mo, Bi, Sn
Low Sulfidation Epithermal	Zn, Hg, Se, K, As, Sb, Ag/Au
Carlin-Type	As, Sb, Hg, Tl
Porphyry Cu–Au	Cu, Pb, Zn, Ag
Au Skarns	Bi, Te, As, Co
Intrusive Related Au	Bi, W, As, Sb, Mo, Te
VHMS	Cu, Pb, Zn, Ag, Ba, K, Mg +/–CO_2
Iron Oxide Cu-Au (U)	F, P, Co, Ni, As, Mo, Ag, Ba, U, LREE
Supergene Au	High fineness Au +/– any of the above

Associated Geochemical Signature of Au Deposits
Source: Reflex Geochemistry

Pathfinder and Alteration Geochemistry

Most Au deposits have an associated geochemical signature (as shown in the table above). The XRF analyzer can detect these geochemical signatures, enabling geologists to better understand the geological system in which they are working. Typical Au pathfinder elements include As, Cu, Pb, Zn, Sb, Bi, Ag, and W.

Typical XRF LODs for Common Au Pathfinder Elements

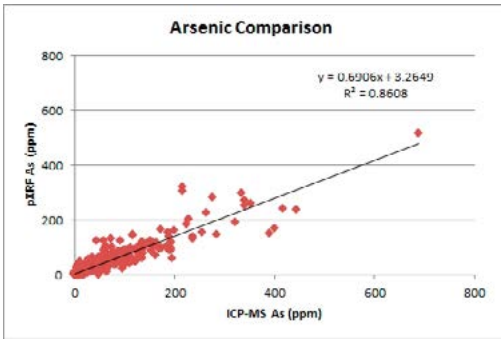
Element	LOD (ppm)*	Element	LOD (ppm)*
As	1	W	1
Cu	15	Bi	5
Pb	2	Sb	5
Zn	10	Ag	2

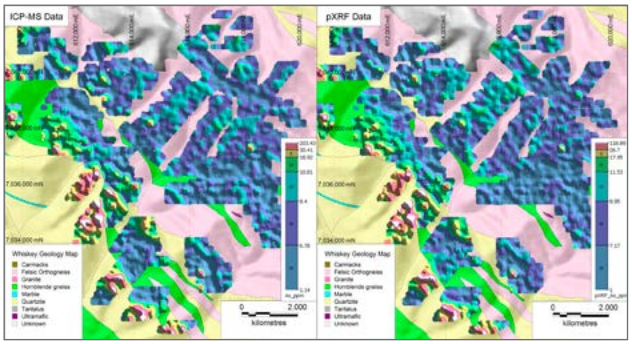
*120 s test time; sample is a typical soil matrix

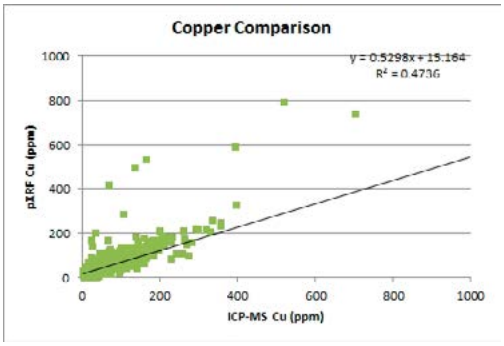
XRF Analyzer for Detection of Gold

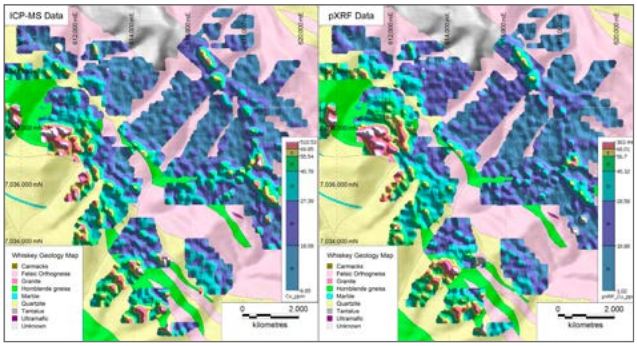
It is common knowledge that handheld XRF analyzers do not support direct low level measurement of Au in geological samples (e.g., low ppm and ppb). The lab-based fire assay technique is commonly recognized as the method of choice for Au analysis. Au L-level X-ray lines are located in a very crowded area of the X-ray fluorescence energy spectrum. In this part of the spectrum, interference from other elements (e.g., As, Zn, W, and Se) can yield a false-positive Au determination. Nevertheless, direct measurement of Au by XRF can be achieved in specific cases such as high-grade (> 5 ppm) quartz vein environments (relatively interference free) or within refined Au products (where Au is present in very high concentrations).

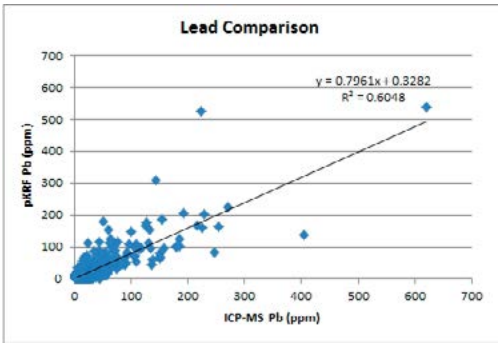
However, an increasing number of Au onsite mining laboratories are using XRF in place of, and as a supplement to, fire assays methods. Please refer to the Olympus Application Note "Use of Handheld XRF in Au Mine Laboratories."

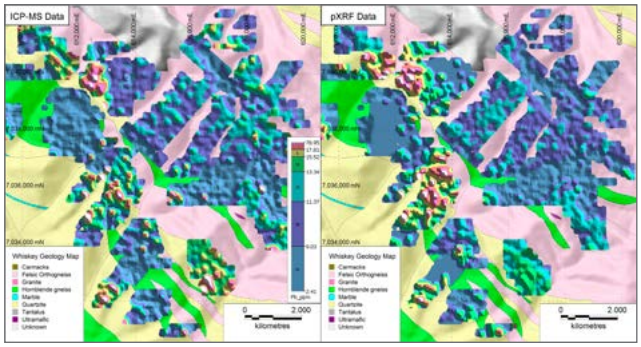












Images taken from: Arne et al. (2014) – The use of property-scale pXRF data in gold exploration – advantages and limitations, Geochemistry: Exploration, Environment, Analysis.
Contor plots of As, Cu, and Pb in surface soil using field XRF compared with ICP analysis from Au exploration project in Canada.

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