Au Mineralisation & FPXRF

Utilization of Innov-X Systems Portable X-Ray Flourescence Analyzers for the determination of PATHFINDERS & GEOCHEMICAL SIGNATURES in Au Mineralization

Introduction & Background:

It is well established that the direct, low level measurement of Au with Field Portable XRF (FPXRF) is not often feasible; however it has been proven as an invaluable tool for analyzing associated mineral suites, such as pathfinder and alteration assemblages that occur with Au.

FPXRF Use For Au Pathfinders & Geochemical Signatures:

The use of geochemical signatures and associated pathfinder element suites is becoming an increasingly useful tool for the delineation of deep buried, blind, ore systems in modern day Au exploration. Some typical applications utilizing these alteration assemblages include:

- mapping structural features & associated alteration zones (ie. potassic enrichment or depletion zones associated with Au mineralization)
- pseudo litho-geochemistry studies; mapping & classification of inferred rock types using elemental geochemistry (commonly using immobile elements such as Ti-Zr-Sr-Rb) – Light Element determination with the Innov-X Vacuum System (+Mg-Al-Si) will also help to dramatically increase this function.
- rapidly establishing background & baseline geochemical surveys
- working with panned concentrates & stream sediment samples
- direct analysis of nuggety, high-grade, vein style mineralization Au >100's ppm levels - managing sub-surface drilling programmes ; has the hole gone deep enough?

Some Typical FPXRF LODs for common Au Pathfinder Elements

Element	LOD (ppm)*	Element	LOD (ppm)*
As	12	Sb	30
Cu	35	Bi	12
Mo	20	Hg	10
Ag	30	W	26

*In typical soil matrix over 120s test time

Our Approach to Au Exploration and Pathfinder LODs

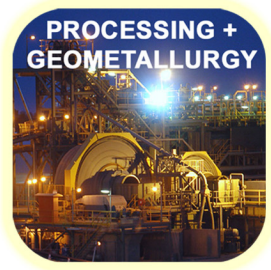
Innov-X Systems has drawn on its superior depth of experience on this subject and established a proven protocol to fully utilize FPXRF for Au applications (particularly Au exploration).Most importantly, Au is NOT included on Innov-X systems default exploration element suites. There are several reasons for this but the basis lies in our underlying philosophy to act responsibly within the resources industry. The most important reason for Au exclusion from our analytical suite lies in the inherent difficulty in preventing FPXRF's from reporting false positives for Au (there are many examples of this). Au lies in a 'crowded' area of the x-ray energy spectrum and is significantly affected by the presence of elements like Zn and W among others. False positives for Au can be very costly and the user can lose confidence in the accuracy of the other data, even when that data is of excellent quality. Au is normally visible under the hand lens of a geologist at 10 g/t and above so the value of the FPXRF becomes obsolete. Au is rarely assayed by commercial laboratories using larger powerful stand alone XRF's. Innov-X Systems recognizes this and considers it inappropriate to suggest that portable XRF is capable of providing sufficiently accurate and precise Au data less than 10 g/t across the range of (particularly exploration) applications required. However, for applications where rapid Au data can add value to businesses (like grade control in a high grade vein type deposit) we can include Au in the quantitative analysis program and customize the element suite accordingly.

Summary Geochemical Signatures

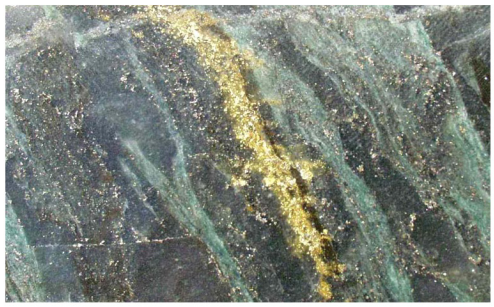
Deposit Type	Geochemical Signature
Orogenic Au	S, As, CO_2, K +/- Sb, Te, Mo, W, Cu, Pb, Zn, Hg
High sulphidation epithermal	Ag, Cu, Te, Mo, Bi, Sn
Low sulphidation epithermal	Zn, Hg, Se, K, As, Sb, Ag/Au
Carlin-type	As, Sb, Hg, Tl
Porphyry Cu-Au	Cu, Pb, Zn, Ag
Au skarns	Bi, Te, As, Co
Intrusive related 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

Table Source: ioGlobal Geochemistry Workshop - Oct 2008

APPLICATION BRIEF



Au Heterogeneity – The # 1 problem with Au sampling & determination…
The principal problem associated with any Au determination resides in the diverse,heterogeneous and frequently erratic (or "nuggety") distribution of Au within complex, mineralized systems. An entire science has been dedicated to "representative sampling"due to the inherent geo-statistical variation of Au distribution often observed in most Au-bearing deposits. As such, bulk sampling and high-quality sample preparation protocols are key to obtaining the best possible Au-bearing sample and are just as valid to FPXRF sampling as with any other laboratory based analytical method.


High Grade Gold Mineralisation In Drill-Core

Why Use FPXRF? The aspect of "True Portability" with the latest generation of XRF's essentially enables the ability to bring a "miniaturized version of the laboratory" into the field, with obvious limitations of course! Innov-X Systems is clear and transparent about these limitations: (1) Higher LOD's than lab-based techniques (2) Lower precision than lab-based techniques (higher +/- values but no compromise on accuracy above LOD's (3) Less repeatable results. FPXRF should not to be seen as a replacement for the Laboratory and should be used in conjunction with laboratory and industry standard reporting protocols such as determined by the ASX (JORC CODE) & the TSX (43-101). The main advantage of FPXRF lies in the ability to generate, dynamic, real-time, spatially registered geochemical data sets, rapidly. The Geoscientist can now immediately postulate the elemental characteristics of the observed regolith or lithology dynamically, making informed decisions whilst still in the field, at the exact location of the sample of interest. Instant and interactive approaches to exploration project management, target delineation and associated vectoring towards mineralization are now possible. This results in significantly reduced timeframes with less time intensive reiterations, such as the excavating samples & sending them to the Lab with the associated "normal" lengthy turnaround times and lags. FPXRF can be thought of as being a "Pre-Screening" tool used to select the "best" and most "appropriate" sample to submit to the Laboratory for comprehensive and more detailed analysis. Additionally, the ability to refine your sampling program in the field real-time means that you can easily increase sample density & resolution instantaneously. These field based efficiency gains are advancing project time-frames and assisting companies to better utilize their time in the field and maximize the use of the exploration budget.

LOD's: The 1 Million Dollar Question!...
The determination of the analytical Limit Of Detection (LOD's) depends on many aspects, often not directly related to the instrumentation of choice. Some of these influences include (cause denoted in brackets):

- The energy of excitation or X-Ray source (instrument) Note: this is not all about obtaining the maximum voltage (or keV). It is reliant on the process of fine-tuning both the X-Ray voltage and current to maximize the received count rate and therefore analytical precision
- The Atomic Number and associated response of element(s) being analyzed (sample)
- Concentration of Elements present(sample)
- Relative Density & Matrix Composition (sample)
- Sample size, Granularity & Surface Geometry (sample & user)
- Length of test run (user) - The Quality of the Instrument Calibration & QC Samples used to "Tweak" the instrument (user & instrument)

AS SUCH, THE SAMPLE IS THE MOST INFUENCIAL FACTOR WITH REGARDS TO DETERMINING LOD's WHEN USING FPXRF.

Our Mission is to "Take XRF out of the lab and into the real world, to help our customers make real-time decisions. Innov-X provides XRF solutions in-line, at line and on-the-move with the industry's best customer support: wherever and whenever needed…"

APPLICATION BRIEF

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INNOV-X SYSTEMS

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