

## Vanta™ Handheld XRF for Gold Analysis



Vanta handheld XRF analyzers are portable, rugged, and modern instruments that can analyze gold across its lifecycle, from exploration and mineral processing to refining and recycling. The analyzers can be used for greenfield and brownfield exploration, artisanal and modern mining, mineral processing, laboratory analysis, and remediation.

### Vanta Model Selection Guide

No matter your position in the gold lifecycle, there is a Vanta model designed for your needs.

Application	Gold Exploration	Chemostratigraphy/ Lithogeochemistry	Gold in Activated Carbon	Refined Gold	Panning for Gold (Prospecting)
Model	M Series	M Series	C Series	L or C Series	Vanta Element or L Series
Calibration	GeoChem (3)	GeoChem (3)	GeoChem (2) or (3)	Precious Metals	GeoChem (1) and Precious Metals

## Accuracy and Performance of Vanta™ XRF Analyzers

Vanta analyzers are calibrated with a large suite of certified reference materials designed to provide accurate gold quantification across various deposit types with up to 1% arsenic or more. This includes shale, limestone, marble, calcite, calcium silicates, oxides, and double refractory matrices. The table below shows the accuracy of the Vanta M Series model against various higher grade samples from the Carlin Trend gold mine.

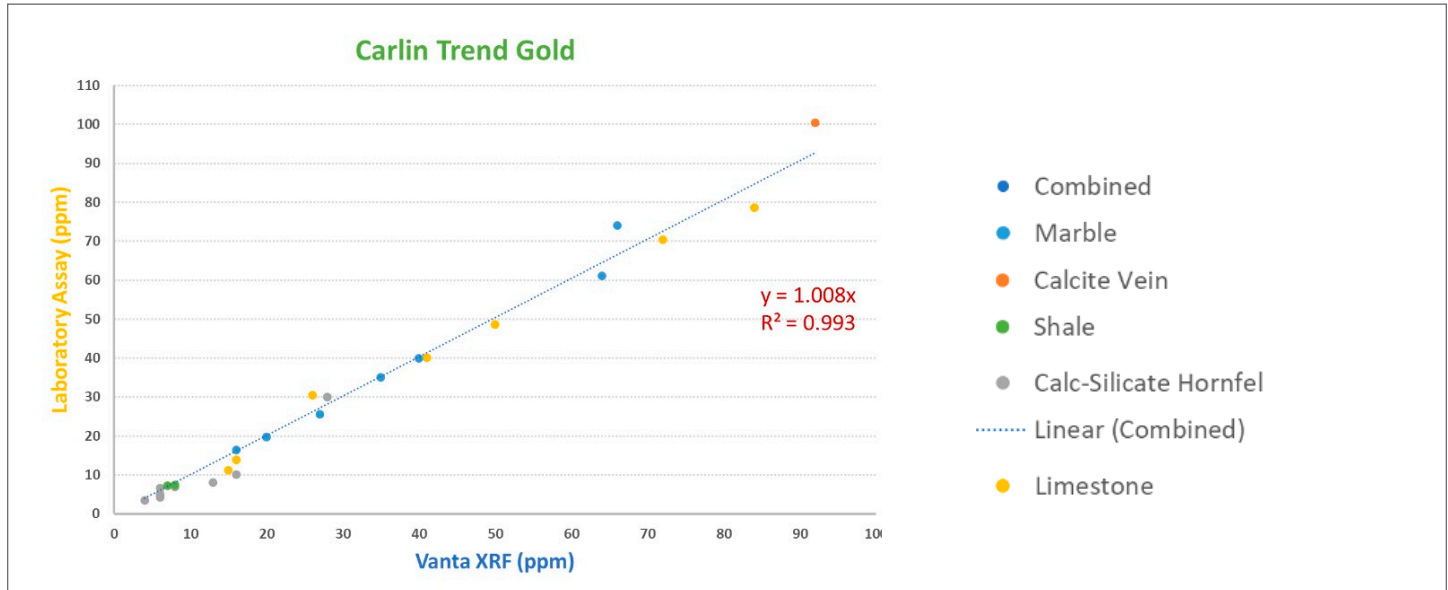


Figure 1: The performance of the Vanta M Series analyzer with GeoChem (3) calibration across a variety of deposit types.

## Limits of Detection\* for Vanta Models

Model	M Series	C Series	Vanta Element™ and L Series
ppm	1 ppm	3 ppm	15 ppm
g/ton	1 g/t	3 g/t	15 g/t
oz/ton	0.029 oz/t	0.088 oz/t	0.437 oz/t

\*Limits of detection (LOD) depend on testing time, sample heterogeneity, and the presence/absence of interfering elements. The LOD value above is the lowest quantity of an element that can be detected assuming an interference-free quartz blank. The LODs represent the calculated value using a three-sigma, 99.7% confidence level at a 120-second test time (per beam). These LODs represent performance under ideal conditions on prepared samples. For unprepared samples, general guidance for in field performance expectations: visual gold (nuggets, flakes, dust), Vanta Element/L Series: 50–100 ppm; dispersed gold in rocks or ore, C Series: 20–50 ppm; exploration, M Series, <20 ppm.

Gold naturally forms clumps or 'nuggets' and is unevenly distributed in the sample. Reported values will be high compared to a lab assay when a nugget is in the X-ray beam, and low if the nugget is missed. Gold has multiple inter-element interferences, including arsenic (As), zinc (Zn), tungsten (W), and selenium (Se). Therefore, gold (Au) results might be either over-reported (false positives) or under-reported (not detected). Using pathfinder elements is recommended for gold exploration. Please contact your local Olympus representative for more information.



## From Gold Exploration to Mineral Processing

About a quarter of all gold is mined from porphyry deposits<sup>1</sup>. Vanta analyzers can be used to assess the fertility of these **porphyry deposits**, whether for gold, copper, molybdenum, and other commodities.

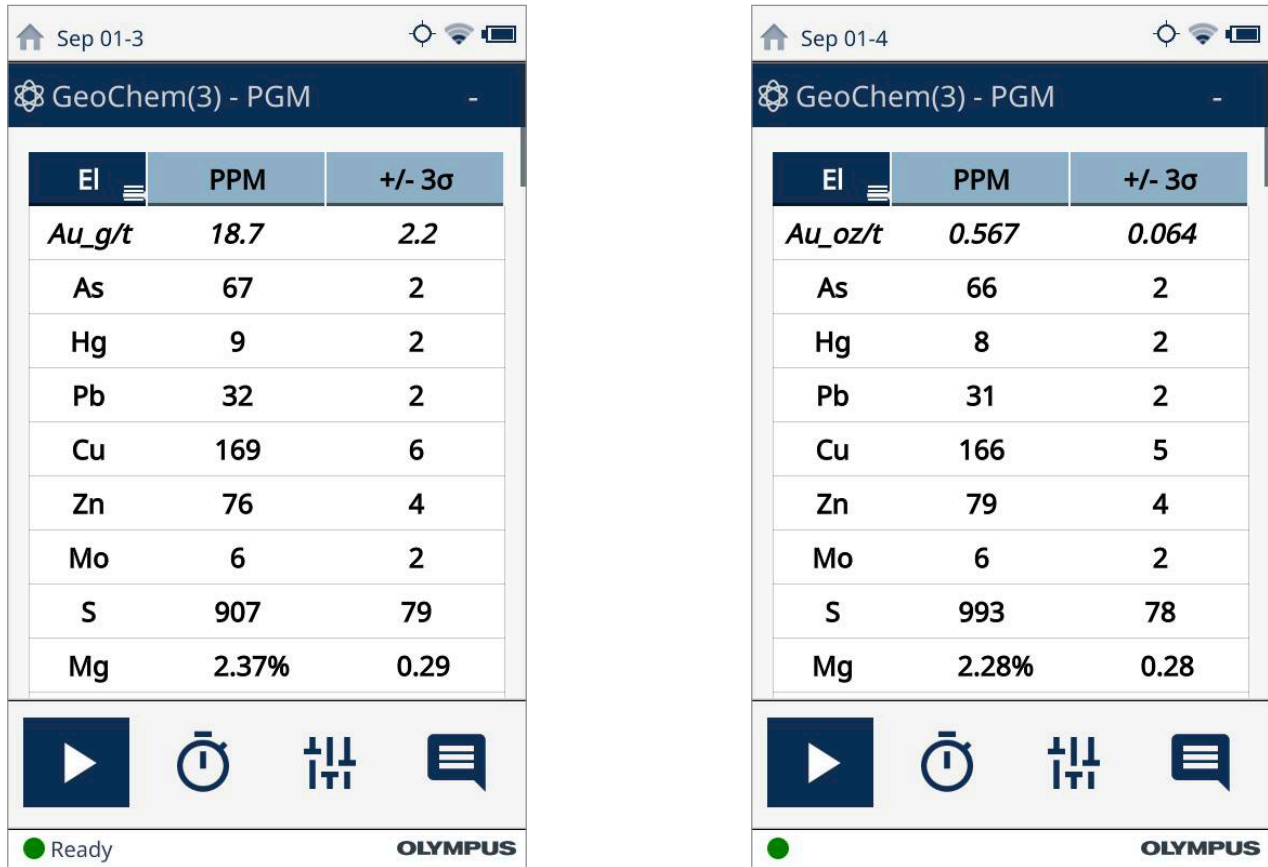


Figure 2: Vanta analyzer reporting g/t (left) or oz/t (right) quantification for gold and silver in weathered greenstone

Although the Vanta analyzer can directly quantify gold in geological samples, **ore body vectoring is frequently done using pathfinder elements**. Vanta analyzers offer onboard GPS and panoramic and aiming camera functions to further enable mapping of structural features and identification of mineralized and altered zones<sup>2</sup>.

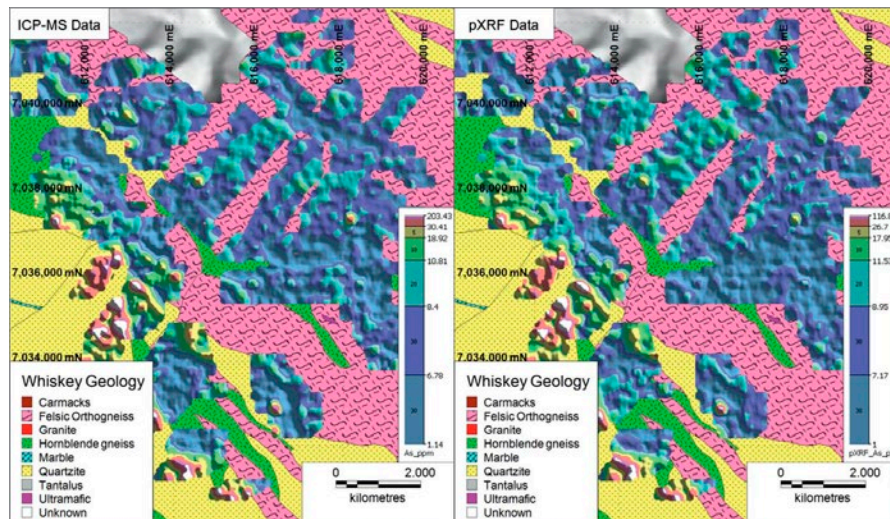


Figure 3: Contour plots of As in soil using handheld XRF (right) compared to ICP analysis (left) in a gold (Au) exploration project in Canada.<sup>2</sup>

When a deposit is identified, the **Vanta™ analyzer can provide valuable lithochemistry and chemostratigraphy** for accurate rock type classifications within the gold deposit. Once the mine is operational, the Vanta analyzer can be used in the lab to **analyze pins, mill feeds, and precipitates**. Gold is regularly recovered from ore using the cyanidation process, then extracted with activated carbon. Vanta analyzers can also **quantify the gold and gangue elements in activated carbon**.

Once the gold is refined, Vanta analyzers can measure purity in place or alongside fire assay. Some mines have documented occupational health and safety (OH&S) and environmental benefits associated with reduced heat stress, less exposure to lead fumes, and reduced use of acids when handheld XRF is used to supplement the fire assay process. Vanta analyzers are also commonly used to measure sulfur content in waste rock to predict acid mine drainage (AMD) potential.

## References

1. Sillitoe, R.H., 2010. Porphyry copper systems. *Economic Geology*, 105(1), pp.3-41.
2. Arne, D. C.; Mackie, R. A., Jones, S. A. 2014. The use of property-scale portable X-ray fluorescence data in gold exploration: advantages and limitations. *Geochemistry: Exploration, Environment, Analysis*. 14(3), 233-244.



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