

Alpha Series™

portable XRF for Cu, Zn, and Pb ore analysis in the mining industry.



Rugged Alpha Series™ XRF analyzer withstands tough mining jobs.

Overview.

Application. The measurement of metals in ores is important for a variety of applications, ranging from exploration and survey, to final processing. Portable X-ray Fluorescence (XRF) is an effective means to achieve quick, on-the spot results of metal concentrations. In this report, a group of samples, with a wide

range of copper, lead and zinc concentrations were measured. Results obtained with the Innov-X Systems Alpha Series™ portable alloy analyzer were compared with data from laboratory analysis.

Hardware. The Alpha Series™ is a handheld X-Ray Fluorescence Analyzer which uses the latest in XRF technology. A Silver Anode Miniature X-Ray tube combined with a solid state SiPIN detector produces quick and accurate results. The tube operates at 35 KeV, 15uA. Detector resolution is better than 220 eV. The analyzer is controlled by an HP iPAQ© pocket computer running Windows CE.

Software. Innov-X Systems Materials Analysis software program uses a Fundamental Parameters (FP) algorithm, which automatically takes into account many inter-element issues which can affect XRF results. This FP algorithm can be fine tuned for matrix differences by a series of calibration factors which can be stored in the analyzer. Multiple sets of calibration factors can be saved in the analyzer for easy recall.

Method.

The samples were submitted as fine powders in plastic bags. They were assumed to be homogeneous, and were analyzed, as is, in the plastic bags, with no further sample preparation. This is thought to be a typical style of analysis for samples of this type. Uniformly homogenizing the samples and preparing them in samples cups may slightly improve the accuracy and precision of these measurements. Had the samples not been well ground and homogeneous, additional sample preparation would be recommended.

A series of known samples were tested using the analyzer. These data were then compared to laboratory data and a calibration curve was established. The calibration values were stored in the analyzer, and the samples were analyzed for 60 seconds.



In-situ survey of mine tunnel used for ore mapping. Alpha Series™ can also evaluate uniformly homogenized samples for comparative lab analysis.



Alpha Series™

provides Cu, Zn, and Pb ore analysis for the mining industry.

Results.

Without a site-specific calibration, the XRF analyzer produced good linearity and reproducibility over two orders of magnitude in concentration – about 0.2% to 20%. Correlation coefficients exceeded 0.95 in all cases. The analysis did show a constant 30% bias over this range with respect to laboratory analysis.

This is typical for portable XRF analysis as the low atomic weight elements including O, S, C, Al, Si, Mg and others are not measured. However, given the bias is virtually constant over a large concentration range, a few samples with known concentrations may be used to generate an empirical correction.

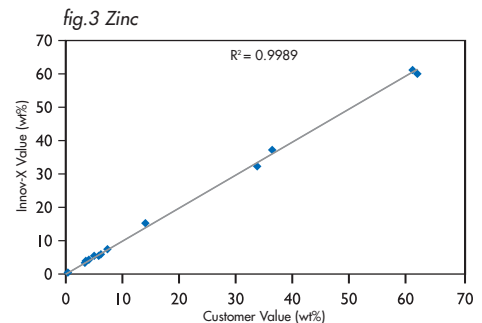
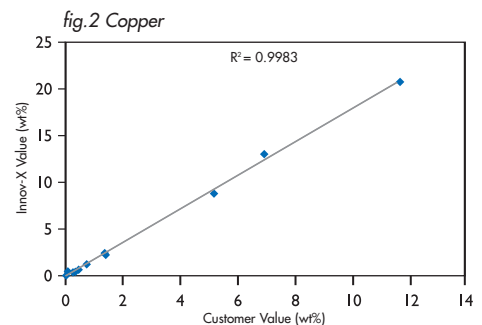
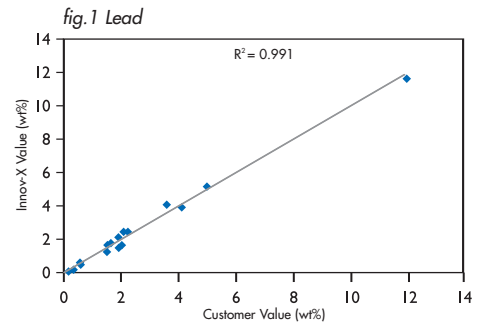


Alpha Series™ achieves fast, on-the-spot results for elemental analysis of P-U for mine mapping and on-site geochemical exploration.

The empirical correction, combined with the fundamental parameters analysis, provides good accuracy over a large concentration range with minimal ore-specific calibration requirements. The user can apply a simple bias correction empirically, to produce results in very good agreement with the laboratory.

Figures 1, 2 and 3 show plots of data obtained with an Innov-X Systems Alpha Series™ alloy analyzer after applying the above noted bias correction, versus values reported by a lab. In all cases, there is a very strong correlation between the data obtained with the portable analyzer and the laboratory.

The R2 correlation for the linear regression is at least 0.99 for all three data sets. All three data sets encompass a wide range of concentrations, indicating the applicability of the samples.



23 V Vanadium 50.9415	24 Cr Chromium 51.9415	25 Mn Manganese 54.938049	26 Fe Iron 55.8457	27 Co Cobalt 58.933195	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61
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