

# Acme Analytical Laboratories Ltd.

## Contact Information

Acme Analytical Laboratories Ltd.  
852 East Hastings St.  
Vancouver, BC, V6A 1R6, Canada  
Tel: (604) 253-3158; 1-800-990-2263  
Fax: (604)-253-1716  
E-mail: info@acmelab.com

## Analytical Procedures

### *Major Oxides and minor elements:*

A 0.2 g split of sample powder was fused with 1.4 g of  $\text{LiBO}_2$  at 1050° C and then digested in 4%  $\text{HNO}_3$  before being taken up to a volume of 100 mL. The resulting solution was then aspirated into a Jarrel Ash Atom Comp Model 975 ICP Emission Spectrometer for the determination of the major elements (Al, Ca, Cr, Fe, K, Mn, Mg, Na, P, Si and Ti) and the minor elements Ba, Ni and Sc. The major oxides were calculated and reported as their most commonly forming oxides (e.g.,  $\text{Al}_2\text{O}_3$ ,  $\text{CaO}$ , etc.).

### *Loss-On-Ignition:*

A 1 g split of sample powder was ignited at 1000° C for 1 hour then allowed to cool in a desiccator. The residue was re-weighed, with the weight difference reported as the LOI.

### *Total Carbon and Sulphur:*

A 2 g split of sample powder was mixed with Fe and W metal chips and placed in an induction furnace and then rapidly ignited at 1800°C. All C and S species were converted to gaseous oxides and swept into an infra-red cell where the concentration was determined by the absorption of infra-red frequencies specific for C and S light passing through the cell.

### *Refractory trace elements:*

The fused rock –  $\text{LiBO}_2$  solution was aspirated into a Perkin Elmer Elan 6000 ICP mass spectrometer for the determination of Co, Cs, Ga, Hf, Nb, Rb, Sn, Sr, Ta, Th, Ti, U, V, W, Zr, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

### *Chalcophile elements:*

A 0.5 g split of sample powder was digested in 3 mL of 1-1-1 concentrated  $\text{HCl}$  -  $\text{HNO}_3$  - demineralized  $\text{H}_2\text{O}$  for 1 hr at 95°C in a hot water bath. Solutions were removed from the bath allowed to cool and made up to a volume of 10 mL. The resulting solution was then aspirated into a Perkin Elmer Optima DV3000 ICP Emission Spectrometer for the determination of Mo, Cu, Pb, Zn, Ni, As, Cd, Sb and Bi.

## Analytical Packages utilized

Group 1DX: Trace elements by ICP-MS are analysed on sample splits of 0.5 g leached in hot (95°C) Aqua Regia.

Group 4A: Whole Rock by ICP rock characterization package comprises four separate analytical tests. Total abundances of the major oxides and several minor elements are reported on a 0.1 g sample analysed by ICP-emission spectrometry following a Lithium metaborate/tetraborate fusion and dilute nitric digestion. Loss on ignition (LOI) is by weigh difference after ignition at 1000°C. Total carbon and sulphur analysis by Leco.

Group 4B: Total Trace Elements by ICP-MS comprises two separate analyses. Rare earth and refractory elements are determined by ICP mass spectrometry following a Lithium metaborate / tetraborate fusion and nitric acid digestion of a 0.1 g sample (same decomposition as Group 4A). In addition a separate 0.5 g split is digested in Aqua Regia and analysed by ICP Mass Spectrometry to report the precious and base metals.

#### Detection Limits

	Group 1DX Det. Lim.	Upper Limit
Mo	0.1 ppm	2000 ppm
Cu	0.1 ppm	10000 ppm
Pb	0.1 ppm	10000 ppm
Zn	1 ppm	10000 ppm
Ni	0.1 ppm	10000 ppm
As	0.5 ppm	10000 ppm
Cd	0.1 ppm	2000 ppm
Sb	0.1 ppm	2000 ppm
Bi	0.1 ppm	2000 ppm
Ag	0.1 ppm	100 ppm
Au	0.5 ppm	100 ppm
Hg	0.01 ppm	100 ppm
Tl	0.1 ppm	1000 ppm
Se	0.5 ppm	100 ppm

	Group 4A Det. Lim.	Upper Limit
SiO <sub>2</sub>	0.01 %	100 %
Al <sub>2</sub> O <sub>3</sub>	0.01 %	100 %
Fe <sub>2</sub> O <sub>3</sub>	0.04 %	100 %
CaO	0.01 %	100 %
MgO	0.01 %	100 %
Na <sub>2</sub> O	0.01 %	100 %
K <sub>2</sub> O	0.01 %	100 %
MnO	0.01 %	100 %
TiO <sub>2</sub>	0.01 %	100 %
P <sub>2</sub> O <sub>5</sub>	0.01 %	100 %
Cr <sub>2</sub> O <sub>3</sub>	0.002 %	100 %
LOI	0.1 %	100 %
C	0.01 %	100 %
S	0.01 %	100 %

	Group 4A Det. Lim.	Group 4B Det. Lim.	Upper Limit
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Au	—	0.5 ppb	100 ppm
Ag	—	0.1 ppm	100 ppm
As	—	1 ppm	10000 ppm
Ba	5 ppm	1 ppm	50000 ppm
Be	—	1 ppm	10000 ppm
Bi	—	0.1 ppm	2000 ppm
Cd	—	0.1 ppm	2000 ppm
Co	20 ppm*	0.2 ppm	10000 ppm
Cs	—	0.1 ppm	10000 ppm
Cu	5 ppm*	0.1 ppm	10000 ppm
Ga	—	0.5 ppm	10000 ppm
Hf	—	0.1 ppm	10000 ppm
Hg	—	0.1 ppm	100 ppm
Mo	—	0.1 ppm	2000 ppm
Nb	5 ppm	0.1 ppm	50000 ppm
Ni	20 ppm	0.1 ppm	10000 ppm
Pb	—	0.1 ppm	10000 ppm
Rb	—	0.1 ppm	10000 ppm
Sb	—	0.1 ppm	2000 ppm
Sc	1 ppm*	—	10000 ppm
Se	—	0.5 ppm	100 ppm
Sn	—	1 ppm	10000 ppm
Sr	2 ppm	0.5 ppm	50000 ppm
Ta	20 ppm*	0.1 ppm	50000 ppm
Th	—	0.2 ppm	10000 ppm
Tl	—	0.1 ppm	1000 ppm
U	—	0.1 ppm	10000 ppm
V	—	8 ppm	10000 ppm
W	—	0.5 ppm	10000 ppm
Y	3 ppm	0.1 ppm	50000 ppm
Zn	5 ppm*	1 ppm	10000 ppm
Zr	5 ppm*	0.1 ppm	50000 ppm
La	—	0.1 ppm	50000 ppm
Ce	30 ppm*	0.1 ppm	50000 ppm
Pr	—	0.02 ppm	10000 ppm
Nd	—	0.3 ppm	10000 ppm
Sm	—	0.05 ppm	10000 ppm
Eu	—	0.02 ppm	10000 ppm
Gd	—	0.05 ppm	10000 ppm
Tb	—	0.01 ppm	10000 ppm
Dy	—	0.05 ppm	10000 ppm
Ho	—	0.02 ppm	10000 ppm
Er	—	0.03 ppm	10000 ppm
Tm	—	0.01 ppm	10000 ppm
Yb	—	0.05 ppm	10000 ppm
Lu	—	0.01 ppm	10000 ppm