

	Geochemistry Global	Doc Type Method Summary Method Code GE_ICP91A50 and IMS91A50 Service Testing Issued Date Apr 2022 Approved by K. Williams
Natural Resources	Multi Element Determination in Exploration Samples using Sodium Peroxide Fusion and Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	

1. Parameter(s) measured, unit(s):

Silver (Ag); Arsenic (As); Barium (Ba); Beryllium (Be); Bismuth (Bi); *Boron (B); Cadmium (Cd); Cerium (Ce); Cobalt (Co); Chromium (Cr); Cesium (Cs); Copper (Cu); Dysprosium (Dy); Erbium (Er); Europium (Eu); Gallium (Ga); Gadolinium (Gd); Germanium (Ge); Hafnium (Hf); Holmium (Ho); Indium (In); Lanthanum (La); Lithium (Li); Lutetium (Lu); Manganese (Mn); Molybdenum (Mo); Niobium (Nb); Neodymium (Nd); Nickel (Ni); Lead (Pb); Praseodymium (Pr); Rubidium (Rb); Antimony (Sb); Scandium (Sc); Samarium (Sm); Tin (Sn); Strontium (Sr); Tantalum (Ta); Terbium (Tb); Thorium (Th); Thallium (Tl); Thulium (Tm); Uranium (U); Vanadium (V); Tungsten (W); Yttrium (Y); Ytterbium (Yb); Zinc (Zn); Zirconium (Zr) in ppm
Aluminum (Al); Calcium (Ca); Iron (Fe); Potassium (K); Magnesium (Mg); Phosphorus (P); Silicon (Si); *Sulfur (S); Titanium (Ti) in %

*Additional analytes on request

2. Typical sample size:

0.1 g

3. Type of sample applicable (media):

Crushed and Pulverized rocks, soils and sediments

4. Sample preparation technique used:

Weighed representative samples are digested fused in glassy carbon crucibles using sodium peroxide (Na₂O₂). The resultant cake is dissolved in HNO₃.

5. Method of analysis used:

The digested sample solution is analyzed by Inductively Coupled Plasma Mass Spectrometer (ICP-MS) and Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES).

6. Data reduction by:

Computer, on line, data fed to SGS Laboratory Information Management System with secure audit trail.

7. Figures of Merit:

This method has been fully validated for the range of samples typically analyzed. Method validation includes the use of reference materials, replicates, duplicates and blanks to calculate accuracy, precision, linearity, range, limit of detection, reporting limit, specificity and measurement uncertainty.

The Reporting Limit has been determined as follows:

Element	Reporting Limit (ppm)	Upper Limit	Element	Reporting Limit (ppm)	Upper Limit	Element	Reporting Limit (ppm)	Upper Limit	Element	Reporting Limit (ppm)	Upper Limit
Ag	1.00	200ppm	Er	0.05	0.1%	Mo	2	1%	Ta	0.5	1%
Al	0.01(%)	25%	Eu	0.05	0.1%	Nb	1	1%	Tb	0.05	0.1%
As	5	1%	Fe	0.01(%)	25%	Nd	0.1	1%	Th	0.1	0.1%
B	10	1%	Ga	1	0.1%	Ni	5	1%	Ti	0.01(%)	25%
Ba	10	1%	Gd	0.05	0.1%	P	0.01(%)	25%	Tl	0.5	0.1%
Be	5	0.25%	Ge	1	0.1%	Pb	5	1%	Tm	0.05	0.1%
Bi	0.1	0.1%	Hf	1	1%	Pr	0.05	0.1%	U	0.05	0.1%
Ca	0.1(%)	25%	Ho	0.05	0.1%	Rb	0.2	1%	V	5	1%
Cd	0.2	1%	In	0.2	0.1%	S	0.1%	10%	W	1	1%
Ce	0.1	1%	K	0.1(%)	25%	Sb	0.1	1%	Y	0.5	0.1%
Co	0.5	1%	La	0.1	1%	Sc	5	5%	Yb	0.1	0.1%
Cr	10	5%	Li	10	5%	Si	0.1(%)	30%	Zn	5	1%
Cs	0.1	1%	Lu	0.05	0.1%	Sm	0.1	0.1%	Zr	0.5	1%
Cu	10	1%	Mg	0.01(%)	25%	Sn	1	1%			
Dy	0.05	0.1%	Mn	10	10%	Sr	10	0.5%			

Note: Bolded elements are reported by ICP-OES.

8. Quality control:

Quality control materials include method blanks, duplicates and reference materials and are randomly inserted with the frequency set according to method protocols at ~11% for exploration grade analysis. Quality control materials will also include preparations blanks and replicates if samples have been taken through the sample reduction process. Instrument calibration is performed for each batch or work order and calibration checks are analyzed within each analytical run.

9. Accreditation:

SGS Natural Resources conforms to the requirements of ISO/IEC 17025. Scopes of Accredited tests are site specific, please visit <https://www.scc.ca/en/search/laboratories>