Maxxam
A Bureau Veritas Group Company

MINING SERVICES

NEUTRON ACTIVATION ANALYSIS FOR THE MINING INDUSTRY

Neutron Activation Analysis (NAA) is a sensitive and accurate analytical method that identifies and quantifies elements in a sample through analysis of characteristic gamma rays emitted during radioactive decay after being irradiated in a nuclear research reactor. These distinct energy signatures provide positive identification of the targeted elements present, while their intensity is proportional to the concentration of the element in the sample.

NAA is considered a *referee method*, being based solely upon nuclear, not chemical properties. The chemical forms of elements present in a sample have virtually no effect on the results.

Advantages of NAA

- Free of contamination from lab chemicals
- Limited matrix effects for geological samples
- No/minimal sample preparation
- Applicable for most matrices: soil, sediment, rock, vegetation, humus, moss, coal, ash, ores and concentrates
- Cost effective analysis of 30+ elements[1]
- Able to analyze large (40g) samples to minimize subsampling

[1] NAA is not suitable for analysis of lead or mercury

Geological Reference Materials

NAA is used to verify the homogeneity of reference materials given its multi-element capability and dynamic range of analysis. The accuracy of NAA makes it valuable for certification of elemental composition and for comparison with other trace element analytical techniques.

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Maxxam is the Canadian market leader in analytical services and solutions to the energy, environmental, food and DNA industries and a member of the Bureau Veritas Group of companies – a world leader in testing, inspection and certification services. We support critical decisions made by our customers through the application of rigorous science and the knowledge and expertise of our over 2200 employees.

For more information contact us:
Email: **rad@maxxam.ca** or
Call us toll-free: **1 877 726 3080**

Geochemical Exploration

Geological surveys use NAA to test stream and lake sediment for Gold and associated elements, such as Arsenic and Antimony.

Gold +33 package (typical detection limits in ppm)

Antimony	0.1	Iridium	0.05	Tantalum	0.5
Arsenic	0.5	Iron	2000	Tellurium	10
Barium	50	Lanthanum	2	Terbium	0.5
Bromine	0.5	Lutetium	0.2	Thorium	0.2
Cadmium	5	Molybdenum	1	Tin	100
Cerium	5	Nickel	10	Tungsten	1
Cesium	0.5	Rubidium	5	Uranium	0.2
Chromium	20	Samarium	0.1	Ytterbium	2
Cobalt	5	Scandium	0.2	Zinc	100
Europium	1	Selenium	5	Zirconium	200
Gold	0.002	Silver	2		
Hafnium	1	Sodium	20		

Platinum Group Elements (PGE) – NAA provides results for all six PGE compared to traditional fire assay techniques that commonly determine Platinum and Palladium.

Platinum	Palladium	Rhodium	Iridium	Ruthenium	Osmium
20 ppb	20 ppb	5 ppb	1 ppb	50 ppb	10 ppb

Biogeochemical Exploration

Key elements analyzed in vegetation and humus (no ashing required):

Gold	Antimony	Arsenic	Mercury	Selenium	Tungsten
0.2 ppb	0.02 ppm	0.1 ppm	0.05 ppm	0.5 ppm	0.5 ppm

Halogens

NAA is applied for measurement of total Chlorine and Bromine in rocks and ores because dissolution and contamination are a problem with other techniques due to the volatility of the elements and their use in mineral acids.

Iridium

The unusual abundance of Iridium in a rock layer may indicate a meteor impact. NAA is used to investigate this Iridium anomaly because of its capability of measuring Iridium in the sub-ppb range.

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