Application Brief
Geochemistry, mining & metals

Agilent
Trusted Answers

Rare Earth Element Determination in Geological Samples Using the Agilent SVDV ICP-OES

Introduction

The Agilent 5110* Synchronous Vertical Dual View (SVDV) ICP-OES instrument offers a range of advantages for rare earth element determination (Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sc, Sm, Tb, Th and Tm) in complex geological samples.

Key benefits for rare earth element analysis

Vertically-oriented plasma for accurate results and less downtime: The Agilent 5110 instrument features a plug-and-play vertical torch. The vertical orientation is ideal for measuring geological samples with their heavy matrices—giving accurate results and requiring less downtime for cleaning than horizontal torches.

Use both axial and radial plasma readings for lower detection limits: The Agilent Synchronous Vertical Dual View mode selects and combines the axial and radial light from the vertical-oriented plasma to measure all wavelengths in a single reading. Wavelengths read axially from a vertically-oriented plasma provide much lower detection limits than those from the radial view.

No more tedious over-range dilutions: The Agilent VistaChip II CCD detector has a large linear dynamic range to reduce the need for additional dilutions of samples. With the full wavelength range available for analysis, you can choose wavelengths for rare earth elements that are free of interferences.

Ease-of-use: The plug-and-play torch automatically aligns and connects to the gases to deliver fast startup and reproducible performance, even with multiple operators.

** Similar results would be expected but no testing has been done on current SVDV instrument, the Agilent 5900*

Analysis example

Rare earth elements in two geological samples (obtained from a commercial mining company) were quantified.

Measurements were obtained in both Synchronous Vertical Dual View and Radial modes, allowing the results to be compared. Refer to full application note for radial view results.

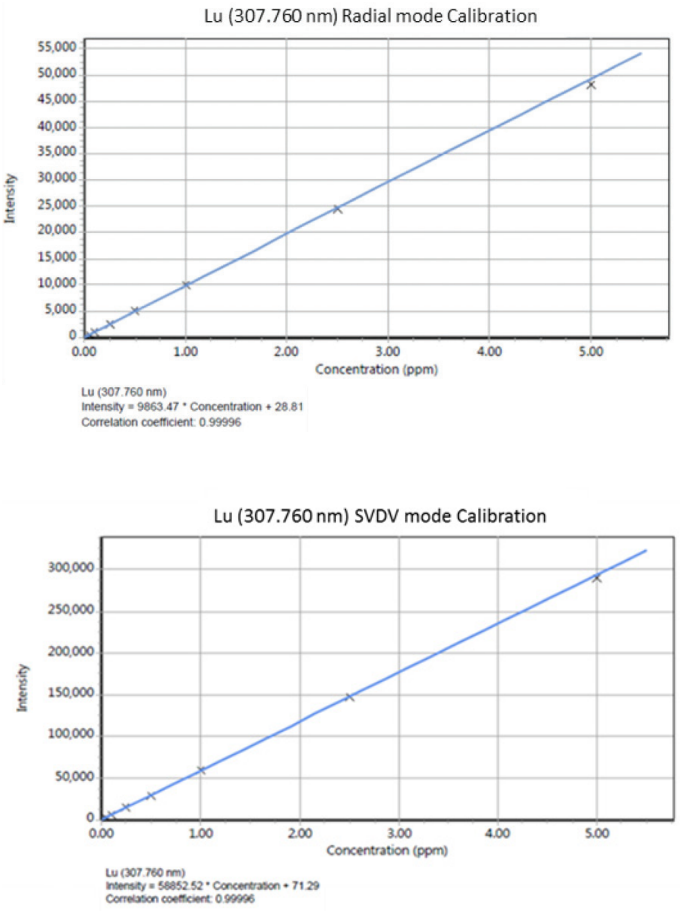

Figure 1. Calibration curves for Lu 307.760 nm in Radial mode (top) and SVDV mode (bottom) shows better sensitivity for SVDV mode.

Table 1. Method Detection Limits (MDLs) and recoveries in a 2.5 mg/L spiked geological sample and quantitative results for rare earth elements in two geological samples.

Element & wavelength (nm)	MDL (mg/kg)	Spike recovery %	Determined values sample 1 (mg/kg)	Determined values sample 2 (mg/kg)
Dy 340.780	0.6	95	60	<MDL
Er 369.265	0.1	97	18	<MDL
Eu 397.197	2.6	97	148	58
Gd 335.048	0.5	94	330	<MDL
Ho 339.895	0.8	95	<MDL	<MDL
La 408.671	0.5	105	8005	2798
Lu 307.760	0.4	96	<MDL	<MDL
Nd 401.224	1.0	106	6332	1730
Pr 422.532	0.02	100	2160	568
Sc 335.372	0.05	96	83	153
Sm 360.949	1.3	92	513	<MDL
Tb 350.914	0.7	98	155	128
Th 283.730	1.6	97	345	225
Tm 346.220	0.08	94	35	<MDL

Results indicate:

- The ability to use wavelengths for the rare earth elements that are free of interferences
- Excellent Method Detection Limits, with Synchronous Vertical Dual View mode achieving lower values than Radial mode in most cases
- Accurate results for geological samples, with 2.5 mg/L spiked sample recoveries within ±10% of expected values

To download full application note:

Go to: http://www.agilent.com/cs/library/applications/5991-6921EN.pdf

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