



Hyperspectral Testing Services

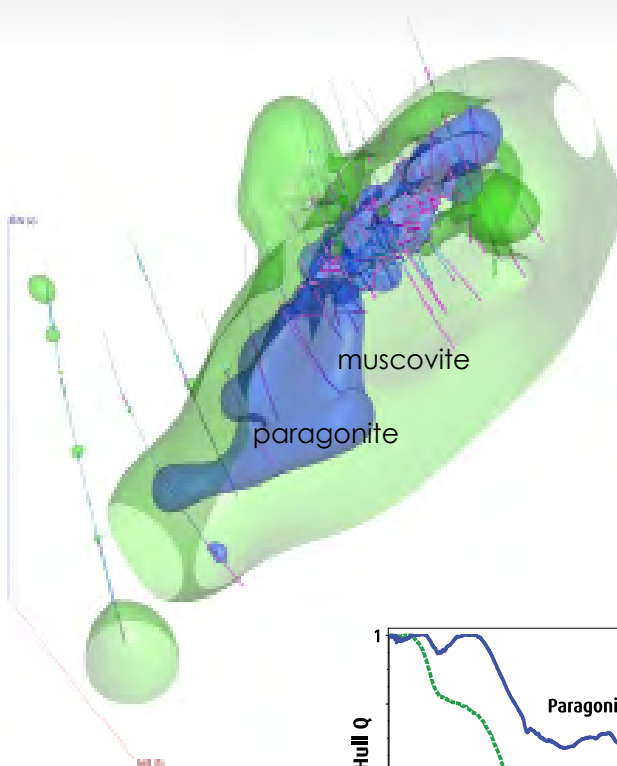
Unlock the full power of spectral imaging

Geochemistry

In today's market, exploration and mining companies' survival depends on the ability of geologists to make crucial decisions on project viability early in the exploration life cycle. One of the powerful scientific tools available to inform these decisions is spectral mineralogy, the identification and imaging of minerals in rocks and drill core using visible and infrared light. Although the application of spectral mineralogy to successful mineral exploration has long been recognized, the challenge for industry has been in the routine and cost-effective analysis of high sample volumes and sensible, timely interpretation of large data sets.

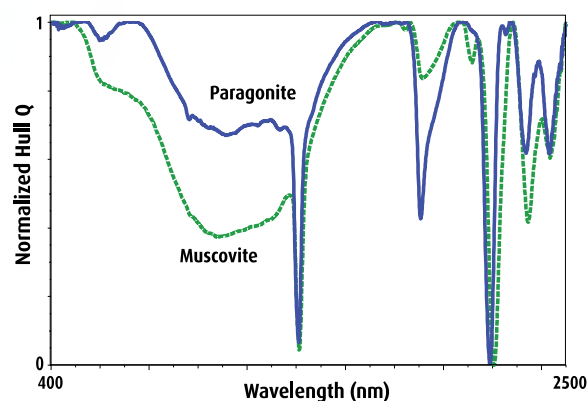
ALS offers a range of hyperspectral solutions including automated web-based integration of data sets to meet your needs. Field and core shed observations can be quickly supported

by proven technologies; imagine the ability to orient your position in the ore deposit system using mineral assemblages in time for seasonal drilling decisions. Early identification of potential recovery and remediation issues in the form of subtle or cryptic mineralogy not obvious through visual identification may save crucial time and money in any exploration project, whether it is generative or mine site.



White mica chemistry shells calculated from a diagnostic white mica absorption: the paragonitic white mica phase shows a spatial relationship with mineralization, and the muscovitic phase represents a more distal halo.

VNIR and SWIR spectra of paragonite and muscovite. Differences in depth and wavelength of adsorption features allows the identification of paragonite-dominated and muscovite-dominated domains as a function of proximity to the ore body.



Spectral Mineralogy Services

ALS offers three options for hyperspectral imaging services that allow seamless information flow from the collection and interpretation of spectra through to integration with other geologic data and presentation on the web for collaborative decision making. Each provides a different level of data definition as appropriate for your needs, with automated interpretation of the spectra using next-generation identification software.

1. The geochemical sampling approach, where an instrument operator captures individual spectra on the core or rejects at set intervals and other areas of interest such as fractures;

2. Automated feed of core boxes through a spot analyzer, capturing more spectra for a higher resolution data set; and

3. Continuous mineral mapping of core at the millimeter scale for characterization of the entire drill hole.

All spectral mineralogy results are reported on ALS certificates of analysis and are available in many spreadsheet formats for rapid import into your geochemical database. Your data is accessible online from anywhere in the world via ALS Webtrieve™.

Spectral Data Capture



Example of data output using TerraSpec® point testing in combination with core images.

For geochemistry-style sampling density, handheld mineral analyzers like PANalytical's TerraSpec® 4 provide rapid, high-quality spectral acquisition over a centimeter-diameter spot. You determine the sampling interval required, such as at each assay sample tag or on crushed core, and our trained technicians capture the data in optimal lighting conditions.

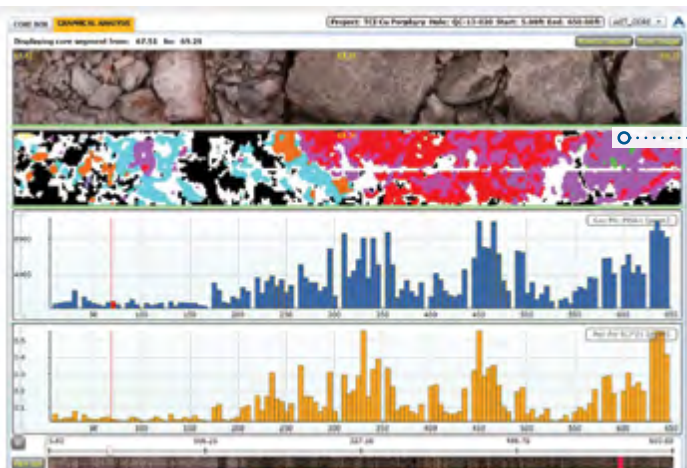
- Spectral mineralogy captured every 10cm or as directed.
- Results may be binned over the entire drill hole.



Example data integration using HyLogger™ continuous scanning in combination with core images.

For additional data intensity and discrimination, HyLogger™, HyChips™ and other automated spot analyzer systems may be implemented for medium density mineralogical data. Core boxes are fed on a conveyor belt through a frame housing the mineral analyzer, which can automatically capture spectra at the centimeter scale.

- Mineralogy at the centimeter scale.



Example data integration using Core Imaging Spectrometer™ continuous scanning in combination with core images.

TerraCore International offers full image spectroscopy of core, chips or field samples. The newest frontier in spectral mineralogy, the GeoSpectral Image™ displays mineralogy across the entire width of each sample. Exploration is revolutionized through a continuous mineral map of core samples at millimeter scale, allowing the geologist to easily identify fine-grained alteration and other features not easily visible in the core.

- High resolution GeoSpectral Image™, each pixel is 1 millimeter



Interpreting Spectral Data

One of the major hurdles in implementing a routine spectral analysis program is interpretation. ALS Geochemistry and AusSpec International bring you a generational leap forward in automatic spectral interpretation with AusSpec's new aiSIRIS™ software.

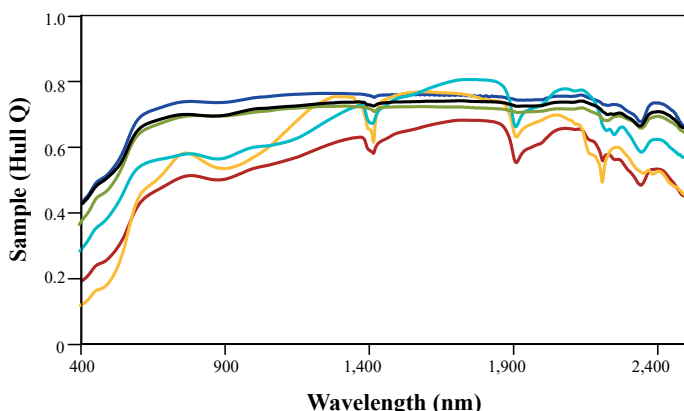
aiSIRIS™ uses coded expert methods for an accurate first-pass interpretation of spectra on any project. ALS will run the spectral interpretation for you and report parameters such as spectral abundance, crystallinity, and mineral composition on

our certificates of analysis and in spreadsheet format. All original and interpreted spectral data may be accessed online, in perpetuity, for further interpretation by experts and consultants as necessary.



AusSpec International
extracting value from spectral data

1. COLLECT SPECTRA



2. AISIRIS™ ANALYSIS

Sample ID	Mineralogy					Spectral parameters			
	Minerals (SWIR)	Minerals (VNIR)	kaolinite	dickite	alunite	hematite	wavAlunite	FeOx intensity	wavFeOxide
34101	Alunite+kaolinite	Hematite	0.41		0.59	1	1480.33	0.71	889.38
34102	Dickite			1		1		0.587	866.53
34103	Alunite+kaolinite		0.35		0.65		1486.79	0.614	
34104	Alunite+dickite	Hematite		0.25	0.75	1	1479.26	0.572	871.94
34105	Dickite+kaolinite	Hematite	0.29	0.71		1		0.414	875.95
34106	Dickite+kaolinite		0.33	0.67				0.479	
34107	Alunite				1		1485.13	0.397	
34108	Dickite	Hematite		1		1		0.345	876.54
34109	Dickite+kaolinite	Hematite	0.28	0.72		1		0.41	870.58
34110	Alunite+kaolinite	Hematite	0.52		0.48	1	1481.08	0.542	883.57
34111	Dickite	Hematite		1		1		0.321	891.11
34112	Kaolinite	Hematite	1			1		0.691	880.44
34113	Kaolinite+alunite	Hematite	0.81		0.19	1	1484.14	0.661	868.4
34114	Dickite+alunite	Hematite		0.56	0.44	1	1477.94	0.49	877.53

3. INTEGRATE INTO COREVIEWER™



Figures workflow:

1. Hyperspectral data is collected using a TerraSpec™ instrument.
2. Data is uploaded to aiSIRIS™, with output consisting of mineralogy and spectral features.
3. Data is integrated with core photography and geochemistry into CoreViewer™ for data interpretation.

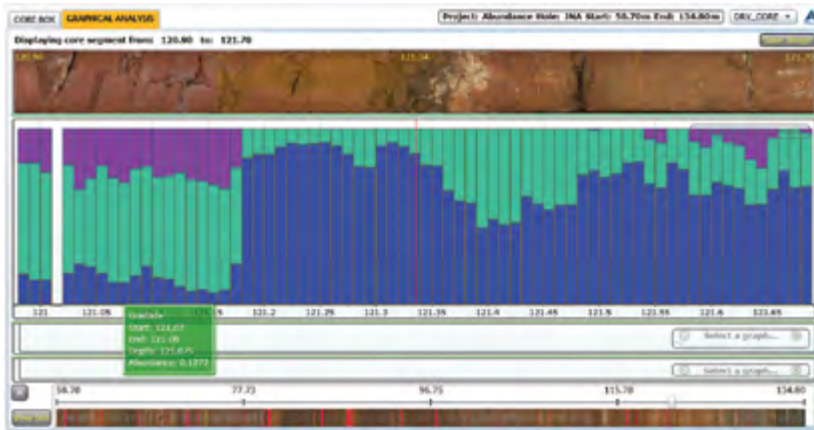
Visualizing Spectral Mineralogy with ALS CoreViewer™

Bringing the wide variety of exploration data in different formats together for fast visualization and interpretation can be time consuming and difficult to achieve. ALS CoreViewer™ is the ideal platform to combine core photographs, geochemical data, downhole physical measurements and mineralogical parameters together in an intuitive, attractive interface for online collaboration inside your company.



Integrating Spectral Data into Deposit Modeling

Finally, the powerful visualization capabilities of ALS CoreViewer™ with core photos, spectral mineralogy, geochemical data and more shown side-by-side can be directly accessed from inside every major 3D deposit modeling program – Micromine, Leapfrog®, and Maptek Vulcan™. These programs can interface with ALS CoreViewer™ to display relevant geochemical and mineralogical data for any drill hole on demand.



Click on any drill hole to open CoreViewer™ for the selected hole and depth



ALS provides a wide range of specialised testing services covering all stages of your project's life cycle.

Please visit alsglobal.com for more information on our services and specialties.



Right Solutions · Right Partner
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