Geochemical Spectroscopy Instrument

Enables quantification of mineralogy, lithology, and organic carbon for improved saturations and reservoir characterization

Applications

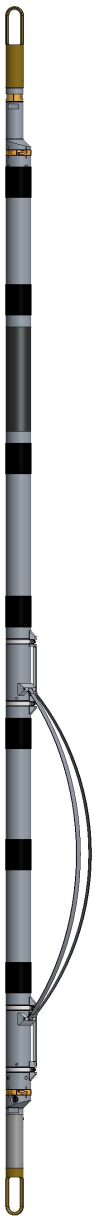
- Mineralogical quantification, including clay types
- Detailed lithological analysis
- Matrix density and matrix-corrected porosity
- Enhanced porosity and oil saturation calculation
- Total organic carbon (TOC) determination
- Formation sigma

Features and Benefits

- The geochemical spectroscopy instrument (GSI) functions as an integrated answer product that generates mineralogy and detailed lithology.
- The service combines 15 elements: 12 from the GSI (Al, Ca,C, Cl, Gd, H, Fe, Mg, O, Si, S, Ti) with three from spectral gamma ray (K, Th, and U) for complete mineralogy determination.
- Diffusion-corrected sigma aids in formation evaluation and reservoir characterization.
- Real-time lithology and elemental concentrations are available at the wellsite, which enables time-sensitive decision-making.
- A 14 MeV pulsed-neutron generator provides for comprehensive inelastic and capture gamma ray detection.
- No chemical radioactive source is required, which enhances safety in the case of a fishing incident or lost-in-hole event.
- The lanthanum bromide (LaBr3) detector exhibits enhanced energy resolution with fast emission and temperature linearity characteristics.
- The instrument can be deployed using advanced Assure™ conveyance techniques.
- Memory capabilities enable cost-effective horizontal logging.

Tool Description

The geochemical spectroscopy instrument (GSI) uses a pulsed-neutron generator to induce inelastic and capture gamma rays. Measuring the gamma rays enables identifying key formation elements. The final lithological and mineralogical interpretation is guided by these elemental concentrations, as well as by the measurement of intrinsic sigma. The interpretation software processes the input, analyzes the lithology, and improves the identification of matrix properties for use in further reservoir characterization.



The geochemical spectroscopy instrument is used in a Weatherford service that measures 15 elements to provide real-time lithology and elemental concentrations. The instrument can be deployed using advanced Assure conveyance techniques.

Weatherford®

Geochemical Spectroscopy Instrument

Specifications

Measurement

Vertical resolution	18 in. (457 mm)
DOI inelastic events	8.5 in. (216 mm)
DOI capture events	10.5 in. (267 mm)
Measurement energy range	0.6 to 9 MeV
Energy windows	256
Capture elements	Ca, Cl, Fe, Gd, H, Mg, S, Si, Ti
Inelastic elements	Al, C, Ca, Fe, Mg, O, Si
All elements (GSI + SGR)	Al, C, Ca, Cl, Fe, Gd, H, K, Mg, O, S, Si, Th, Ti, U

Mechanical

Tool diameter	3.25 in. (83 mm)
Tool length	11.5 ft (3.5 m)
Temperature rating	302°F (150°C)
Pressure rating	15,000 psi (103 MPa)
Maximum hole size	24 in. (610 mm)
Minimum hole size	3.75 in. (95 mm)
Neutron source	14 MeV pulsed-neutron generator

Answer Products

Field deliverables	Elemental concentrations including Al, Ca, C, Fe, Gd, K*, Mg, S, Si, Th*, Ti, U*
	Formation sigma
	Dominant lithology
	Qualitative elements (H, Cl, O)
Standard interpretation	Formation mineralogy (in dry weights and volumes)
	Detailed lithology (lithofacies)
	Matrix density
	Clay types and volumes
	Organic carbon
	Matrix-corrected porosity
Advanced interpretation	Saturation
	TOC/kerogen volume
	Integrated answer products

*Th, U, and K come from the spectral gamma ray.

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