



GORE™ Surveys

FOR OIL AND GAS EXPLORATION

Amplified Geochemical Imaging™

Amplified Geochemical Imaging™ is an advanced geoscience tool developed by W. L. Gore & Associates, Inc. – the inventors of GORE-TEX® fabrics. The tool is used to measure and map compounds in diverse applications such as environmental site assessment, pipeline integrity management, petroleum exploration and field development and mineral exploration. Gore's unique and highly sensitive passive diffusion module can detect these compounds in soil gas, air and water, at levels in the sub part per billion range.

PETROLEUM EXPLORATION

GORE™ Surveys for Exploration has been used effectively in over 130 basins in more than 56 countries in all terrains including desert, jungle, plains, tundra, and offshore.

ENVIRONMENTAL SITE ASSESSMENT

GORE™ Surveys for Environmental is used for accurate site assessments, vapor intrusion investigations, ground and surface water sampling and long-term site monitoring.

MINERALS EXPLORATION

The GORE™ Surveys for Minerals is used to explore for buried mineral deposits of gold, silver, copper, lead and zinc. It also has application in identification of productive diamond kimberlite pipes.

EXPLORATION / PROSPECT EVALUATION



Used in exploration applications, GORE™ Surveys help focus geophysical efforts, prioritize leads, or investigate charge in structural and stratigraphic traps. Defining charged channel sands, difficult to find by seismic alone, is an easy task for Amplified Geochemical Imaging™.

FRONTIER



The use of Amplified Geochemical Imaging™ in frontier applications allows timely evaluation of very large blocks (thousands of km²). It is used to validate the petroleum system, make decisions on areas of the block to keep or drop, evaluate leads, and to focus a seismic program to areas of identified charge.

FIELD DEVELOPMENT



GORE™ Surveys defines areal extent of producing fields and locates field extensions and potential areas for secondary recovery. In older fields, GORE™ Surveys help increase production and build reserves by finding by-passed pay and improving the effective design of water and CO₂ flooding.

OFFSHORE



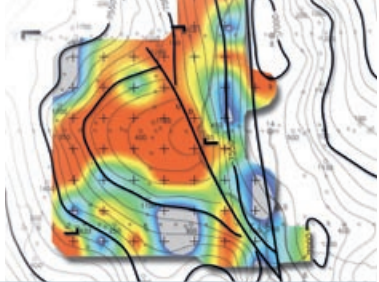



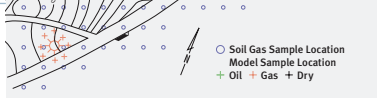
The same analytical and statistical techniques to characterize microseepage onshore are also used offshore. The unique design of the GORE™ Module allows it to be placed in swamps and shallow bays as well as deeper offshore exploration, including ultra-deep waters.

As part of a conventional macroseep basin evaluation, the GORE™ Survey has the following advantages over conventional headspace and sediment extraction techniques:

- Offers data in the critical gasoline range of C2 – C20
- Identifies oxidized or bio-altered compounds from the petroleum system
- Avoids wasted costs of cores which miss targeted seabed seepage features; has the sensitivity to detect thermogenic influence from such “near misses”
- Utilizes advanced mathematical and computer techniques to characterize and classify petroleum signatures

Gore also offers the most comprehensive and easy to use device for sampling offshore natural oil slicks & gas seeps or onshore seeps.

Amplified Geochemical Imaging™

<h2>Final Report</h2>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Gore's proprietary expertise in data analysis and interpretation</p>	<p>Results are summarized and reported in a professional package that includes:</p> <ul style="list-style-type: none"> • QA/QC summary • Geochemical modeling • Color contour probability maps • Summary & conclusions 	
<h2>Interpretation & Integration</h2>		<ul style="list-style-type: none"> • Examination of chemical “fingerprints” • Advanced statistical interpretation • Integration of geochemical data with geological and geophysical data seismic data / well logs / production logs 	
<h2>Data Analysis</h2>		<ul style="list-style-type: none"> • Sensitive to compound specific results • Analytical compound standards • 85+ compounds ethane to phytane (C2 – C20) Aliphatics / Aromatics / NSO compounds 	
<h2>Fieldwork/Sampling</h2>		<ul style="list-style-type: none"> • Local partners in many regions • Passive, time integrated • Applicable in all soil/ groundwater environments • Regular and irregular grids • Spacing dependent upon prospect dimensions: Frontier: 1 – 3 km grid spacing Exploration: 250 – 1000 m grid spacing Development: 50 – 500 m grid spacing 	
<h2>Survey Design</h2>		<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Planning & Field</p>	<ul style="list-style-type: none"> • All terrains & climates (saturated, frozen and arid soils & rock) • All substrates & surface conditions • Modeling of analogue reference wells
<h2>G&G Information</h2>			

Compared to traditional surface geochemical techniques, Amplified Geochemical Imaging™ incorporates the combined advantages of improved sampler design, higher sensitivity, robust data set, and multivariate statistical interpretation.

Realize the benefits of GORE™ Surveys

GORE™ Surveys – Amplified Geochemical Imaging™ has overcome the limitations of early surface geochemical techniques. These limitations include the inability of the sampling method to cope with heterogeneous soil characteristics including permeability, moisture and organic content, a limited set of compounds (C1 – C6 only) as well as the lack of using advanced mathematical and statistical tools to differentiate noise from signal.



Technical Advantages

APPLICABILITY

Works in all soils:

- All kinds of dry to water-saturated soils or directly in water volcanic layers, thick salt sequences, intertidal zones, deltas, swamps.
- Desert, rainforest, permafrost

Applicable where seismic is not possible or effective:

- Populated or access-limited areas, archaeological, natural reserves
- Seismic blind spots, e.g. Karst, volcanic
- Deep reservoirs (successfully used up to 7.500m)

No negative environmental impact

ACCURACY

Sensitive detection:

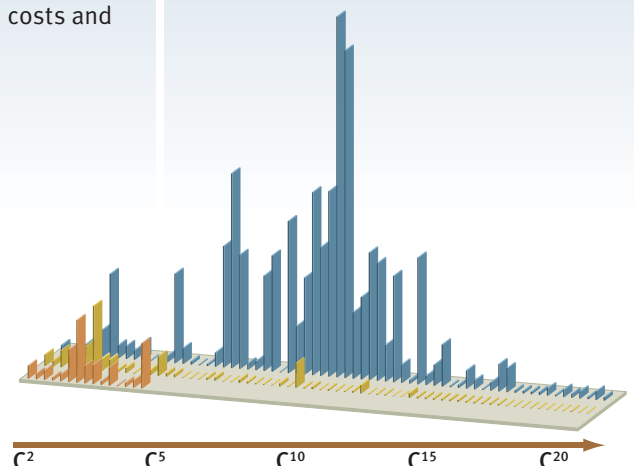
- Detects up to 85 different target compounds, from C2 to C20, with high accuracy
- Sensitive detection limits of about 1 billionth of a gram
- ~90% accurate in detecting petroleum systems
- ~90% accurate in predicting dry holes avoiding associated costs and time losses

VERSATILITY

Light and versatile fieldwork: Installation is easy, simple and inexpensive using hand tools.

- Portable service – no export restrictions
- Low cost and convenient hand carry or courier shipping
- No soil removal from sovereign countries

- Other active methods
- GORE™ Surveys background signature
- GORE™ Surveys petroleum signature





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Commercial Advantages

Based on its advanced technology GORE™ Surveys offer significant savings of time and money:

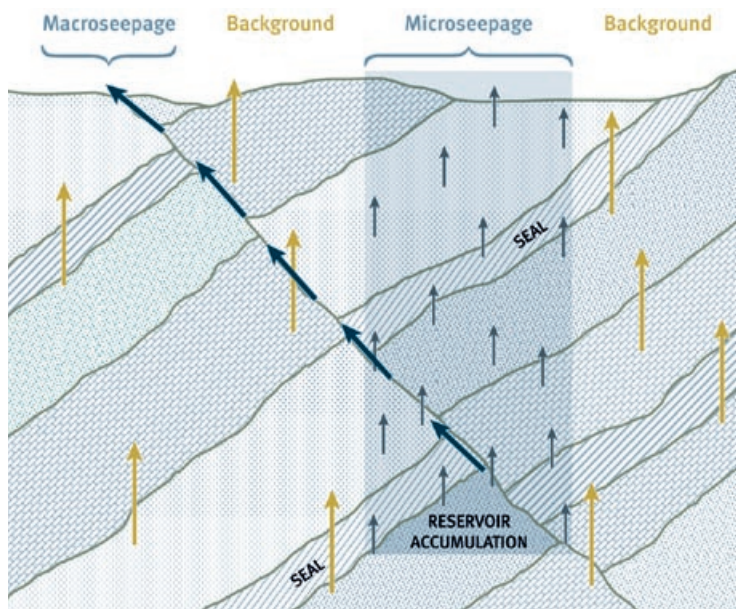
- Evaluate large areas quickly and efficiently
- Help ranking prospect applications
- Provide simple, inexpensive and fast field work
- Verify and characterizes petroleum systems at a fraction of the cost of seismic

Using Amplified Geochemical Imaging™ where seismic is ineffective, or combining seismic with this technique can dramatically increase success.

MICROSEEPAGE

Vertical and non-vertical hydrocarbon migration both occur routinely. With the Amplified Geochemical Imaging™ service, detection of hydrocarbons migrating along fault lines (macroseepage) can be chemically differentiated from background hydrocarbons and from those migrating vertically via microseepage.

The patented GORE™ Module, with its vapor-permeable membrane, proprietary sorbent technology and passive deployment, enables the capture of microseepage signals from interstitial hydrocarbon gases. Building on this proprietary collector, Gore's Amplified Geochemical Imaging™ combines sensitive GC/MS analysis and advanced mathematical and statistical techniques to identify and analyze the microseepage signal resulting in a map of hydrocarbon charge.



Amplified Geochemical Imaging™

THE GORE™ MODULE

An important component for the success of GORE™ Surveys – Amplified Geochemical Imaging™ is the unique passive adsorbent sampling system. The GORE™ Module contains a specially engineered hydrophobic adsorbent encased in an expanded polytetrafluoroethylene (ePTFE) membrane. The ePTFE membrane repels soil particles and liquid water, but the unique pore structure, much larger than the molecules of interest, provides an unimpeded path to the adsorbent. This allows the module to cope with many local and regional variations in soil character and to be placed directly in dry or saturated soils or in water up to a depth of about 10 m.



1 A 1,5 cm diameter hole is placed 60–100 cm into the surface.



2 The module is attached to a retrieval string

The benefits of GORE™ Modules

Engineered sorbents

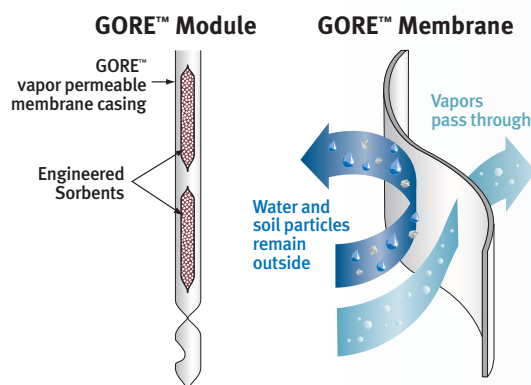
- Consistent sampling medium
- Collects a wide variety of volatile inorganic and organic compounds (C2–C20) allowing differentiation of petroleum phase types (gas, condensate, oil)
- Multiple samplers within each module allow for back-up or duplicate analysis

Protect sample integrity

- Manufactured in a cleanroom and QC qualified to minimize data noise
- Unique identification number to ensure rigorous QA/QC and accurate sample tracking
- Highly durable collector design: Chemically-inert, waterproof, vapor permeable

Allow passive, sorbent-based, time-integrated sampling

- Smooths temporal variations due to barometric pressure, rainfall, and temperature.
- Minimizes near-surface variability
- Avoids potential errors inherent in instantaneous sampling





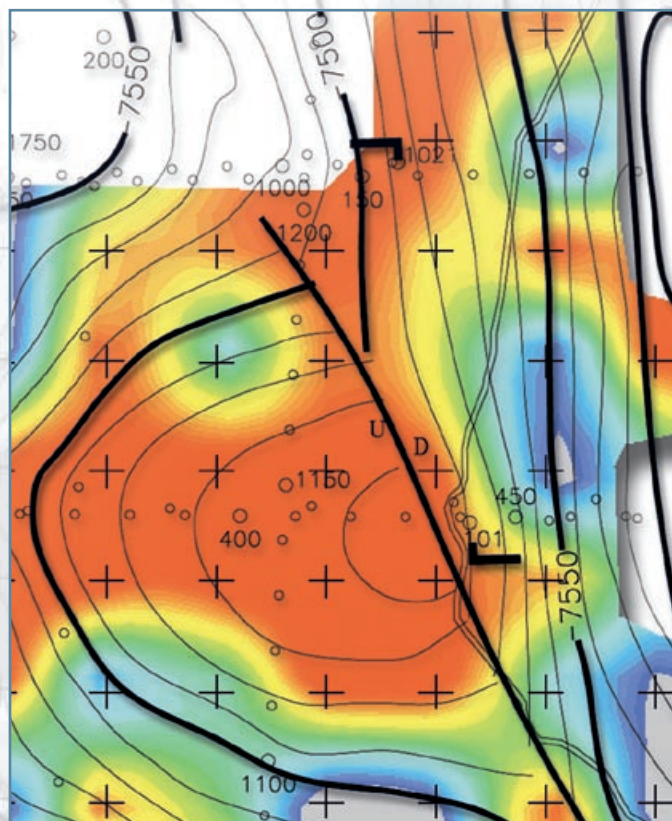
MODULE DEPLOYMENT

Installation and retrieval of GORE™ Modules is rapid, easy, simple and inexpensive using hand tools in soil or hand drills in rock or permafrost.

Exposure time depends on the application and can vary from 15 minutes for environmental water sampling to two months in rock over buried ore deposits. Typical soil exposure time for petroleum exploration is 17 – 21 days.

3 The module is inserted into the hole. The hole is then sealed with a cork or simply caved in to isolate it from the atmosphere.

4 Exact position is recorded via GPS



W. L. GORE & ASSOCIATES – EXPERTISE IN THE OIL & GAS INDUSTRY

Gore has been proving its expertise in the oil and gas industry for over 10 years. Our products set new standards for product reliability and performance:

- GORE-TEX® Heat & Flame Garments with GORE™ Antistatic Technology provide durably waterproof, highly breathable all weather protection combined with lasting antistatic protection.
- GORE™ OMNIBEND™ Fiber for high performance ropes used in deepwater installation of subsea hardware. The fiber makes the difference between reliable performance and premature failure. It acts as a durable dry barrier to abrasion, reducing friction and elevated temperatures normally caused by friction.
- GORE™ Geophysical Seismic Cables provide superior performance and reliability for under water applications, such as marine geophysical seismic exploration. They enable longer cable life and reduce downtime associated with cable failure.
- GORE™ Surveys: Oil & gas exploration, pipeline integrity surveys and refinery site assessment.
- Gore Sealant Technologies in petrochemical installations.



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W. L. GORE & ASSOCIATES

W. L. Gore & Associates is a worldwide company, providing diverse, high-performance solutions in consumer, industrial, electronic, medical and surgical markets. The company's innovations extend from the first waterproof, breathable fabric to electronic cables used in space exploration. A privately held company, Gore is committed to continuing its 50-year tradition of product innovation. Today the company employs over 8,000 people in 45 plants and sales locations, and sells thousands of high-performance products in diverse markets around the world.

**If you would like to know more, please contact us.
We would be happy to assist you.**

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