

SPECTRAL EVOLUTION

Finding Oil and Shale Gas

Finding new oil and shale gas deposits is a top priority worldwide, with a recent revival in North America. Using an NIR field spectrometer or spectroradiometer provides a rapid and inexpensive means for determining the mineralogy of samples and identifying petroleum and gas bearing formations. Oil and gas reservoirs seep—when seeps are visible they are called macroseeps—non-visible ones are called microseeps. Hydrocarbon microseeps are important to oil and gas exploration and are usually found at the surface through detection of trace concentration of gasses (ethane or methane), mineral alteration of soils, or changes to spectral response in vegetation. Sites affected by hydrocarbon microseepage can show mineral alteration in the formation of calcite, pyrite, uraninite, magnetic iron oxides and sulfides, clay mineral alteration (conversion of smectite to kaolinite), and other anomalies.

In addition to soil analysis, hydrocarbon seepage can also be detected through the effects on vegetation, especially the amount of chlorophyll in leaves. Reflectance properties of vegetation in the visible range are dominated by the absorption properties of chlorophyll with absorption at 660 and 680nm. Changes in chlorophyll concentration produce spectral shifts near 700nm—the red edge. The red edge shifts toward the blue area of the spectrum when chlorophyll is lost and shifts toward the red with increased chlorophyll. Lack of chlorophyll is an indicator of potential for oil and gas.

UV/VIS/NIR spectrometers and spectroradiometers from SPECTRAL EVOLUTION deliver fast, accurate, and flexible ways to measure both hydrocarbons in soil and changes in vegetation. NIR spectroscopy brings the following benefits to oil and gas exploration:

- ◆ Fast collection of data in minutes
- ◆ Minimal or no sample preparation
- ◆ Precision, accuracy, and a wealth of information—especially if the spectra are combined with chemometrics software
- ◆ Non-destructive technique
- ◆ Affordable measurement technology
- ◆ *In situ* measurement with portable, field spectroradiometers and spectrometers

A full range spectroradiometer or spectrometer, such as SPECTRAL EVOLUTION's PSR-3500 or PSM-3500, provides:

- ◆ Spectral range of 350-2500nm
- ◆ One-touch operation with autoshutter, autoexposure and auto-dark correction before each new scan – no optimization step
- ◆ Small and lightweight with rechargeable Li-ion batteries
- ◆ Superior signal to noise ratio: faster scan times and better reflectance measurement
- ◆ Reliable field performance with all photodiode arrays and no moving gratings
- ◆ Single user operation with optional rugged PDA that provides a sunlight readable screen plus the ability to tag spectra with GPS, digital camera images, and audio notes



SPECTRAL EVOLUTION field spectroradiometers and spectrometers are simple, non-destructive, reliable, fast and accurate for vegetation reflectance



SPECTRAL EVOLUTION's DAR-Win SP Data Acquisition software with EZ-ID and the Custom Library Builder module provides for mineral identification in the field to help in oil and gas exploration.

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