SPECTRAL EVOLUTION

Measuring Total Organic Carbon in Soil

Total Organic Carbon (TOC) is a measure of the organic carbon contained within soil organic matter (SOM). Organic carbon in soil is a result of the decomposition of plant and animal matter, living and dead microorganisms, roots from plants, and soil biota (which includes earthworms, nematodes, fungi, protozoa, bacteria, etc.).

TOC affects soil characteristics, including color, nutrient capacity (cation and anion exchange capacity) nutrient stability and turnover, and subsequently water relationships, aeration, and cultivation. Total organic carbon and soil organic carbon refer to the same thing. TOC is the main source of energy for soil microorganisms and affects plant growth as a source of energy and a trigger for nutrient availability through mineralization. Measuring TOC can provide information on soil fertility, aggregate stability, and the exchange of CO2 with the atmosphere—all important for environmental monitoring and precision agriculture. VIS/NIR field spectroscopy offers a fast, accurate and affordable alternative to lab analysis of TOC—an alternative that works without destroying the sample. The PSR+ is a field spectroradiometer specifically designed for spectral analysis *in situ*. It's rugged and reliable with a range of direct attached FOV lenses as well as fiber mount options with a steel-jacketed fiber optic cable that's field swappable. A full range spectroradiometer, it covers wavelengths from 350 to 2500nm—UV/VIS/NIR.

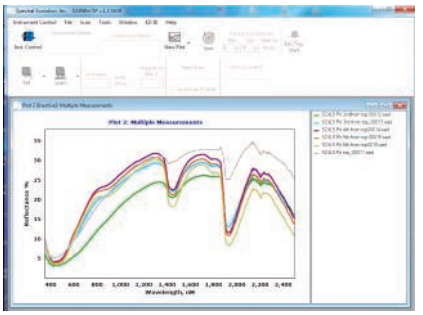
In a typical soil spectra, TOC spectral features would be seen at 1100, 1600, 1700-1800, 2000, and 2200-2400nm. To determine TOC it is important to have high resolution spectra for analysis. Other materials that may be present in soils with similar absorption features include hydrocarbons with narrow features at 1180 and 1380nm, and broad features at 1680-1720nm and 2300-2450nm. In addition, calcium carbonate also shows strong absorption at 2335nm.

The PSR+ high resolution and enhanced sensitivity allow you to quickly collect clear spectra. Auto-shutter, auto-exposure, auto-dark current capabilities mean no manual optimization between scans. For soil analysis, the PSR+ can be equipped with a rugged and reliable sample contact probe, as well as a benchtop probe with sample compactor. The PSR+ is ideal for taking scans of vertical or horizontal soil layers in a pit.

Our DARWin SP Data Acquisition software gives you complete control of your instrument interface, access to vegetation indices as well as the USGS sample library, and saves all spectra and metadata as ASCII files for use with 3rd party software such as ENVI, TSG, R, Unscrambler and GRAMS. Optional EZ-ID sample identification software can help you match your target samples to the USGS, SpecMIN and GeoSPEC mineral spectral libraries to quickly identify clays. Or with the Custom Library Builder module, you can create your own soils and TOC library by simply saving your metadata and scans.

NIR spectroscopy can be used in conjunction with complementary technologies, such as portable XRF where you can use the data from a PSR+ with the elemental analysis from XRF technology for a more complete picture of TOC and other soil properties.

Soil analysis using NIR spectroscopy can measure total organic carbon (TOC), water, carbon, nitrogen, clay, and pH.



DARWin SP Data Acquisition software is included with every SPECTRAL EVOLUTION spectroradiometer. The software allows you to display multiple scans of different soil samples for comparison.

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