SPECTRAL EVOLUTION

Measuring Phosphorus in Soil

Soil nutrients affect crop growth and yield. Growth depends on soil phosphorus, potassium and nitrogen availability and has an impact on soil productivity. Most soils have an inadequate supply of phosphorus. Chemical fertilizers and manure are most often added to boost soil phosphorus. There are two reasons to adopt technologies that can result in precision fertilizer application: phosphorus fertilizers are constrained by finite resources—therefore accurate application and efficient use is required. Second, over fertilization can result in runoff and leaching into water systems. This can lead to contamination and eutrophication of inland fresh water bodies and stimulation of phytoplankton and microalgae growth in coastal water bodies. This can lead to the decline of light penetration and dissolved oxygen.

Conventional analysis of soil phosphorus is laborious and time-consuming. NIR spectroscopy provides an alternative that is fast, less costly and can be applied *in situ*. In soil, phosphorus usually takes the form of phosphates: calcium phosphate, aluminum phosphate, iron phosphate dihydrate and magnesium phosphate hydrate. Iron phosphate dihydrate has recognizable absorbance peaks at 867, 1464 and 1944nm. Magnesium phosphate hydrate has two peak values at 1419 and 1938nm. Calcium phosphate shows two distinct peaks at 1439 and 1948nm. Aluminum phosphate shows low absorbance between 1374 and 2500nm.

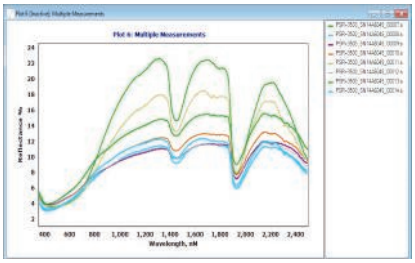
The PSR+ is a lightweight, reliable high resolution NIR spectroradiometer designed for field use. The PSR+ covers the full UV/VIS/NIR range from 350-2500 nanometers with unmatched sensitivity and accuracy. It is easy for one person in the field to use with an optional handheld microcomputer and direct screw-on lenses, or fiberoptic connection to a pistol grip or sample contact probe. The PSR+ includes our exclusive DARWin SP Data Acquisition software with access to the USGS spectral library and 19 vegetation indices. It can work in standalone mode to store up to 1000 field scans before offloading. It is supplied with two rechargeable lithium-ion batteries each capable of up to 4 hours of use for a total of 8 hours of scanning. The PSR+ is also available with a benchtop probe and sample compactor for soil analysis use in the lab.

Optional EZ-ID sample identification software includes access to mineral identification libraries — very useful for identifying clays in soil. Using pattern matching algorithms, EZ-ID matches your target scan to known samples and provides a matching "confidence level" percentage. It also allows you to quickly take scans of known samples and create your own region-specific soils library.

Since DARWin software saves all your spectra as ASCII files, it can easily be imported into 3rd party analysis or chemometric programs like TSG, Camo's Unscrambler and R^2.

In addition to measuring phosphorus content, other soil analysis applications can include: nitrogen measurement, topsoil fertility, erosion risk, hydraulic properties, soil degradation, total organic carbon, organic matter in soil, CEC, and indirect measurement of soil pH.

Soil analysis using NIR spectroscopy can measure phosphorus, water, carbon, nitrogen, clay, pH, and organic matter.



DARWin SP Data Acquisition software allows you to display multiple scans for comparison and saves as ASCII files for use with chemometrics software

An optional benchtop contact probe with sample soil compactor is useful for lab-based soil measurements.

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