SPECTRAL EVOLUTION

Analysis of Clays in Soil

Soil analysis is increasingly important as an essential component in nutrient management for healthy soil and efficient crop production. Most soils are a mixture of clay, organic matter, sand, and silt. Clays play an important role in nutrient availability as they have a large surface area and negative charge. Plant nutrients tend to be positively charged, such as CA^{+2}, Mg^{+2}, K^{+}, and Na^{+}. The ability to hold and store positively charged ions is called cation exchange capacity (CEC). The more clay in soil, the higher the CEC.

Clay also acts as a binder for soil particles, helping soil to retain moisture and reduce nutrient loss due to leaching. Clays are silicate minerals—part of the phyllosilicates. Silicate clay minerals are aluminosilicates and include familiar clay minerals such as kaolinite, smectite, illite, montmorillonite, and others.

Soil analysis using a full range UV/VIS/NIR spectroradiometer with a spectral range from 350-2500nm, is fast, non-destructive, doesn't involve hazardous chemicals and is very affordable. A spectroradiometer can collect valuable data on organic and inorganic content, including clay minerals and soil organic matter. By analyzing the absorption peaks, a researcher can create a picture of what is in the soil. Water usually includes specific absorption bands in the spectra near 1400 and 1900nm. Absorption in the visible range 400—600nm are indicators of iron-containing minerals such as hematite and goethite. These minerals also have smaller absorption features at 880 and 930nm. Clays show strong features in the higher wavelengths related to absorbed and structural water and Mg-, Al-, and Fe-OH bonds. For example, kaolinite has doublets at 1350-1450nm and 2100-2250nm. Montmorillonite has peaks at 1400nm, 2200nm, and 2400nm. Illite has broad features at 1400nm, 1900nm, and 2200nm. Smectite has pronounced absorption near 1900nm due to water bound in the interlayer lattices as hydrated cations. Soil organic matter tends to have broad absorption in the visible region and also 1100-2400nm.

The PSR+ field portable spectroradiometer from Spectral Evolution has the features required for accurate and fast soil and clay identification and analysis. With its industry leading resolution and sensitivity, it collects clear spectra from clays and soil organic matter that are essential for accurate analysis. The PSR+ is made for field use—take it right into the soil pit and collect data from different soil layers. Equipped with optional EZ-ID software, it can compare your target spectra against two spectral libraries to match against known samples of different clays from different locations. In addition, the Custom Library Builder module allows you to create your own spectral library from known field samples for a particular application, region, or analysis.

The PSR+ can be used with a tablet, laptop, or handheld microcomputer. An all solid state photodiode array design ensures that it won't break down in the field. Field swappable fiber means a break doesn't require sending the instrument back to the factory. The PSR+ weighs seven pounds and fits in an optional backpack. Two re-chargeable Li-ion batteries keep it powered for a full day of data collection.

PSR+ is lightweight and easy to use—ideal for analysis in the field.

Use the PSR+ with our contact probe for soil analysis or our benchtop probe with soil compactor.

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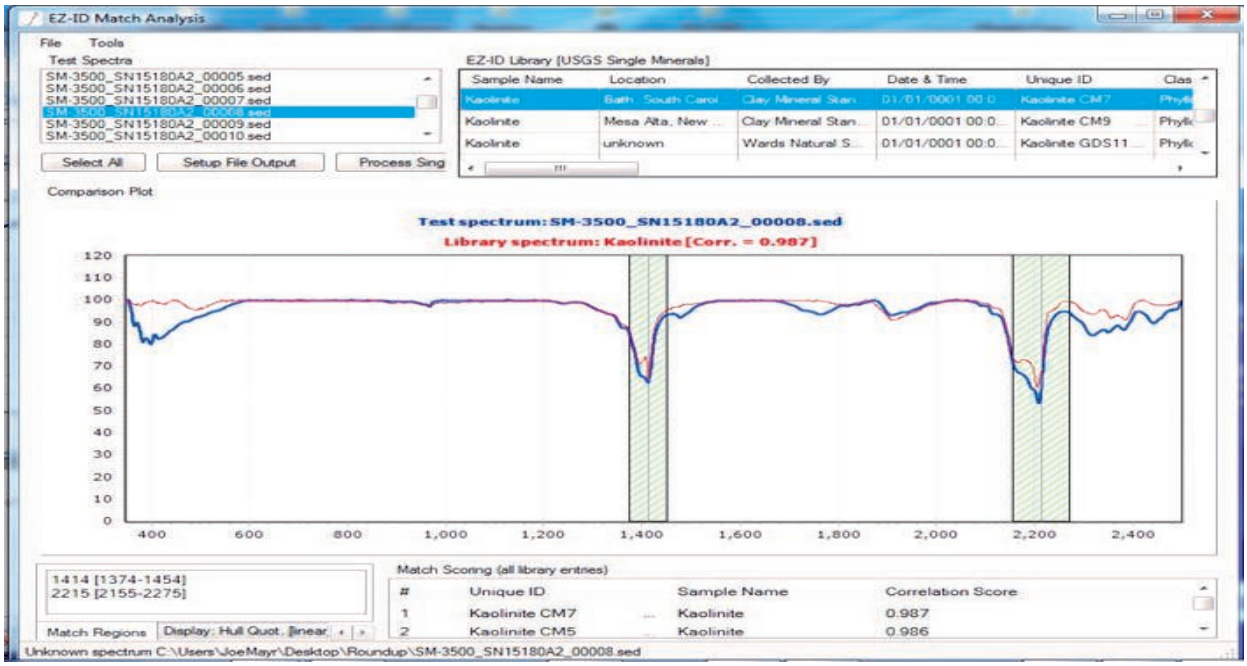
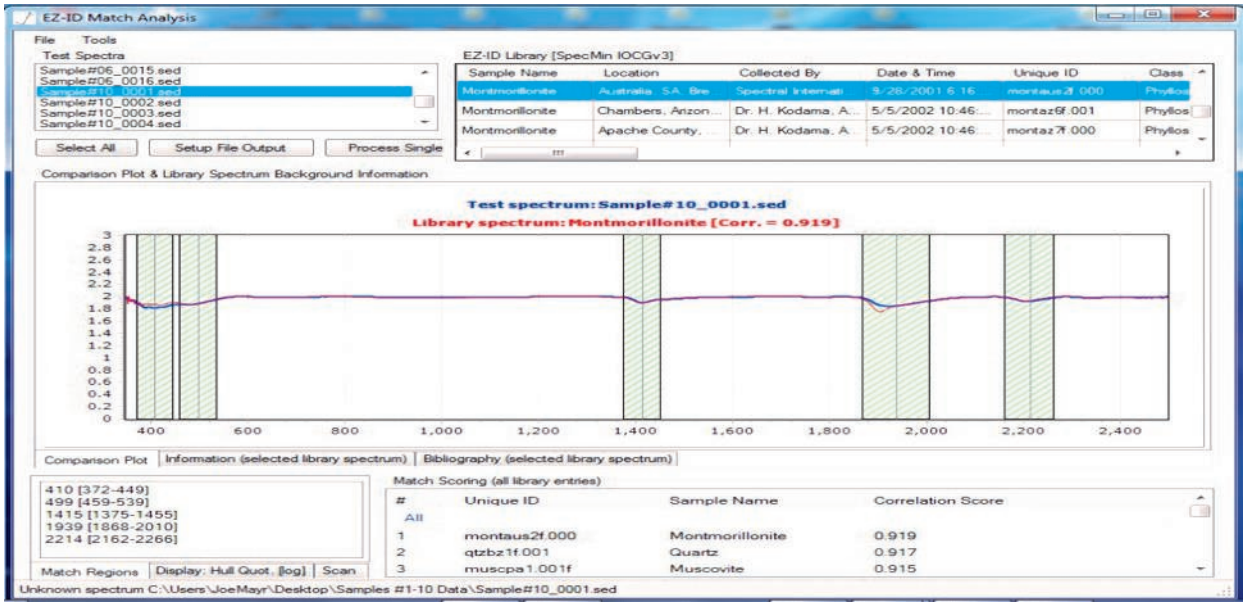


Kaolinite identified by the PSR+ running EZ-ID sample identification software. Red line is the library spectra; blue the target spectra.



Montmorillonite identified by EZ-ID.

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