Analyse heated soil with the Golden Gate ATR

Soil can be analysed at a range of temperatures easily with the Specac Golden Gate ATR accessory.

Introduction

FTIR SPECTROSCOPY CAN BE USED to study the chemical profile of soil samples, providing information on both the organic and inorganic components.

In particular, you can determine what natural chemicals or artificial contaminants are present in soil quickly after sampling and testing at various temperatures.

When coupled with an Attenuated Total Reflectance (ATR) accessory, spectroscopic measurements are fast and repeatable. The ability to distinguish different soil types makes the ATR technique invaluable for forensic, environmental, agricultural and other applications.

The Golden Gate requires minimal sample preparation. Pellet-pressing and grinding are not necessary, the ATR accessory accepts samples in their native state.

This particular note demonstrates how the Golden Gate ATR accessory (with a heated top-plate) can be used to record spectra of soil samples at different temperatures.

Methods

10 mg samples of soil were taken from the banks of the River Cray in Orpington, United Kingdom. They were then placed onto the Specac Golden Gate ATR for spectroscopic analysis.

Spectra were recorded at different temperatures, from 25–90 °C, using the Golden Gate accessory's heated top-plate function.

The broad absorption bands at around 3300 cm^{-1} and 800 cm^{-1} and the sharp peak at 1600 cm^{-1} indicate the high concentration of water in the soil samples. As the temperature increases these bands decrease in intensity, indicating the water is evaporating.

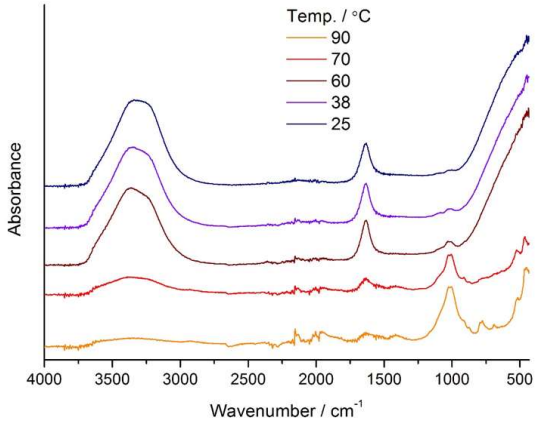

Figure 1: spectra of soil at different temperatures

The mineral features around 500 cm^{-1} become uncovered. The different samples contained different concentrations of clay, as indicated by the varying intensity of the Si-O stretch at 1040 cm^{-1}.

The Heated Golden Gate accessory can go to higher temperatures to monitor the chemical breakdown of the soil and detect released gases such as CO_2.

Conclusion

The Golden Gate ATR accessory was ideal for the ATR analysis of soil. Heating the soil was easy and practically no sample preparation was needed.

This kind of method allows the testing of soil for the presence of heavy metals, clay, chemicals and other pollutants or significant contents.