

Soil Spectroscopy: Advance Soil Analysis Prediction Technology

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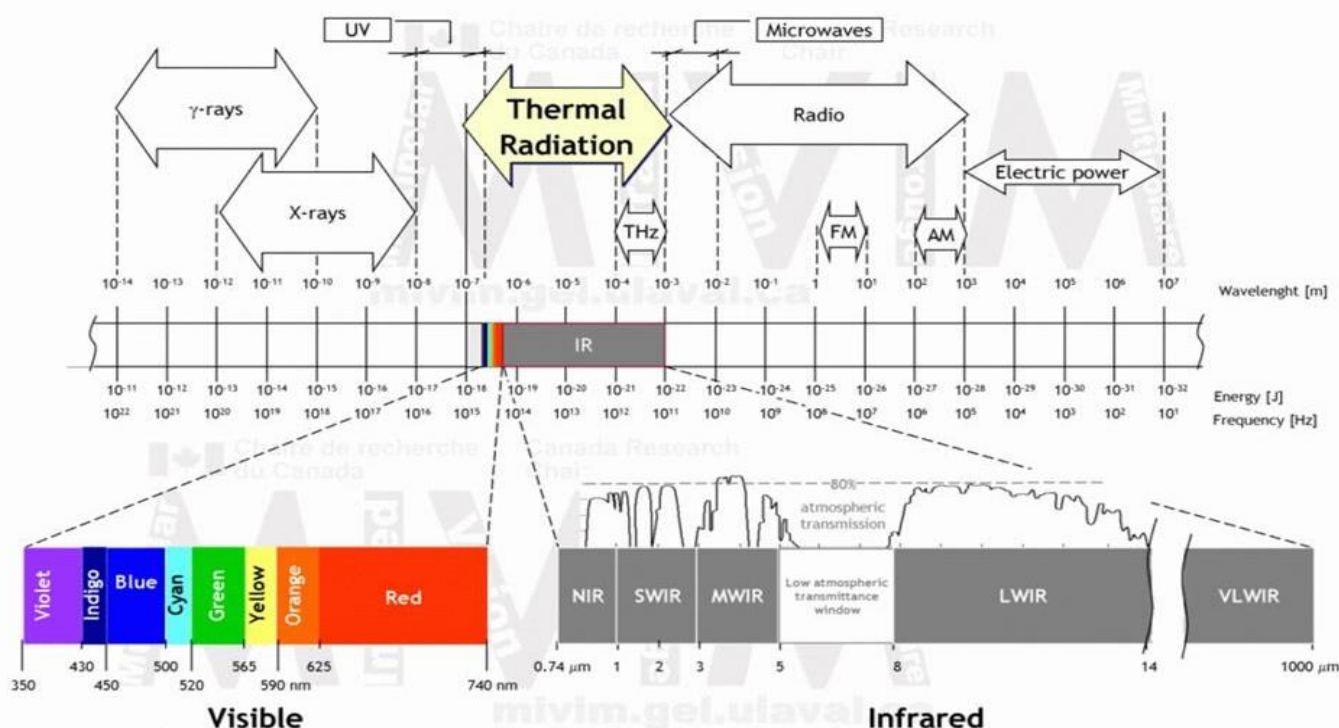
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SUMMARY

Soil world database is essential need to monitor soil status. Soil Spectroscopy is analytical method by which soil properties can be measured and monitored for large area in big scale. This technique is very easy, less costly and environmental friendly. For soil property prediction visible spectroscopy and Infrared explained in detail.

INTRODUCTION

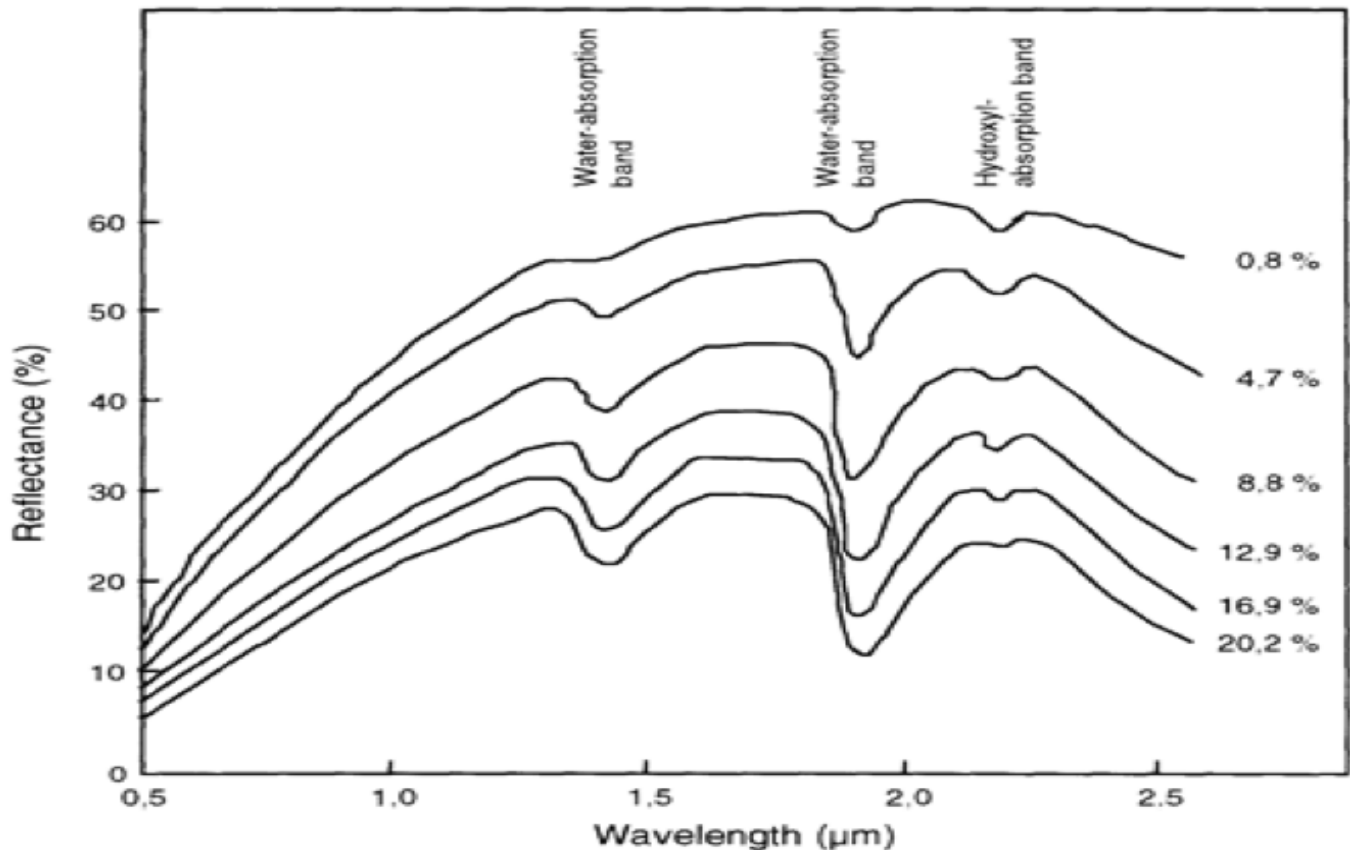
Wavelength range between 0.4mm and 0.78mm is the Visible light (Vis) of EM Spectrum. Radiation involvement with soil generates power due to transfer of charge and effect of field concept. Some bands and colour of soil can be captured by human eye of EM spectrum. Vis and UV spectroscopy Owen (2000) are good to provide soil spectral quantitative information spectra (Viscarra Rossel *et al.*, 2006). Wavelength range between 0.78 mm and 1mm is the Infrared (IR) radiation of EM Spectrum. Energy of frequency corresponds to molecular transitional vibrational energy of EM Spectrum. The basis of IR spectroscopy is so the product of activated molecules interatom vibration. Soil samples profile related to chemicals mainly provided by IR spectroscopy. Out of Magnetic and electric part of EM radiation electrical part is cause of vibrations which absorbs radiation IR. Some of the types are Wag, stretch and Bend. Numbers of books are available for understanding Herzberg (1945) and Alpert *et al.* (1970) of IR spectroscopy. Three main parts which describes radiation related with IR the far, Near and Mid infrared, having ranges given as, FIR: 25e1000 m1 NIR: 0.78e2.5 mm and MIR: 2.5e25 mm, whereas the region related to atoms vibration in fundamental molecules is active in FIR as well MIR parts of EM Spectrum. Illustration related to history and basic function is present in Stuart (2004) and Aenugu *et al.* (2011). IR spectroscopy has several applications ranging from electronics, semiconductors, food, Pharma sector and soil property analysis (Davis, 1998). IR spectroscopy can be described as FTIR in range of MIR (Modern Instrumentation works).



Source: <https://www.agrocares.com/en/news/nir-soilanalysis/>

Soil Property Prediction using Spectroscopy

Simple and less costly technique for rapid soil analysis solution is based on use of Spectroscopy. For samples preparation reagents not required (Malley *et al.*, 2004; Viscarra Rossel *et al.*, 2006). One spectrum is sufficient to give prediction about complex soil part information (Islam *et al.*, 2003). This spectrometer is very portable and one can use it onsite in field. Spectral characteristics of samples of soil was shown by correlating moisture of soil and concern spectra (Bowers and Hanks *et al.*, 1965) afterwards spectral library which consists of USA sample soil and soil classification with respect to spectral curves were segmented into 5 parts were done very promptly (Stoner and Baumgardner *et al.*, 1981). Later soil property prediction (Dalal and Henry *et al.* 1986) based on multi statically system and soil spectral data started (Ben Dor and Banin *et al.* 1995).



[Source: <https://www.agrocares.com/en/news/nir-soilanalysis/>]

Electric conducting capacity (Viscarra Rossel *et al.*, Todorova *et al.*, 2011, 2006; Ben Dor *et al.*, 2002;), Ion of Cation exchange capacity (Canasveras S ~ anchez *et al.*, 2012), different texture (Sørensen and Dalsgaard, 2005), Organic natured carbonate (Gobrecht *et al.*, 2014), total phosphonates present ion soil (P) (Abdi *et al.*, 2012), Potash which we can exchange (K) (He *et al.*, 2005), and such quantitative approach was used to give insight about above listed soil properties with the help of spectroscopy. Additionally, some metals and their alloids like (Pb, Hg, As and Cd) can be exploited with the help of scope. Chromophores (organic carbon, carbonates, etc.) are also having some direct and indirect relation with soil by which will help us to give information about active and non-active profiles based on spectral libraries (Reeves *et al.*, 2006).

Vis NIR are very famous than MIR instruments and also has less effect of environmental parameter on them. Lab field scopy in Vis – NIR and MIR –TIR part uses sensors for airborne image processing

spectroscopy shows properties of soil. So, it does not only cover Vis –NIR but MIR-TIR (Thermal) region. COPERNICUS/GMES provide low cost soil properties global spectroscopic data for mapping.



[Source: <https://blog.hunterlab.com/blog/color-measurement/methods-soil-analysis-using-spectrophotometric-technology/>]

CONCLUSION

In this article, Soil spectroscopy is explained in detail. Vis and IR is explained as well. Soil part information based on samples how plays a cost effective role in predicting characteristic of soil is illustrated. Metals, metals allied (Pb, Hg, As and Cd) and chromophores organic carbon, carbonates, etc.) also been calculated with the help of Soil Property Prediction using Spectroscopy explained.

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