D-55: Spectral differences of volcanic rock units in the Near - IR (1300-2500 mm) range, Troodos Ophiolite Complex, Cyprus

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The Troodos Ophiolite Complex in Cyprus is widely accepted as one of the best exposed ophiolite complexes in the world. Out of the complete ophiolitic sequence, the volcanic series rock units, especially the Upper Pillow Lava (UPL) and Lower Pillow Lava (LPL) are difficult to map in the field due to their close similarities. UPL are generally undersaturated, often olivine bearing basalt, occuring at the top of the sequence. Dikes form less than 10% by volume, silica and celadonite are absent, and calcite and analcime are common. LPL are mainly over saturated basalt, often intensely silicified and celadonite is common.

Dikes, sills and massive flows form between 30 - 60% of the outcrop. In the present research, a detailed study of the pillow lava series rock units was carried out using spectral analytical and field verification studies.

Spectral curves of the soil and rock samples, collected from Troodos volcanic series rock units and their weathered products were recorded using the Portable Infrared Mineral Analyser (PIMA - II spectrometer). When recording the spectral curves, several precautionary measures were taken to minimise the errors due to secondary sources such as water content, grain size of the sample, etc. and to get smooth curves. The resultant spectral curves were analysed using the PIMAVIEW software package.

Spectral analytical studies of the pillow lava series rock and soil samples revealed that some characteristic absorption features can be observed in UPL and LPL soil and rock units. Similarity in reflectance and absorption features of both UPL rock and soil samples indicate that the soils developed on UPL reflect the spectral signature of the parent UPL materials and their weathered products. It is clear that when the pinkish inter pillow materials are absent in the UPL samples, the absorptions are influenced mainly by carbonate ions and the spectrum is identical to that of LPL. Spectral studies further reveal that the absorption features of LPL soils and rocks are alike which correspond to the features of black inter pillow materials of LPL.

The most characteristic mineral identified in the LPL series is the green coloured celadonite. It is a K,Fe,Mg rich aluminium silicate mineral. Celadonite occur as stain and open space filling in lava and in some of the dikes. Spectral analysis of pure celadonite indicates that its spectral signature is similar to glauconites. The occurrence of celadonite in LPL and its absence in UPL can be used to explain that the two lava units have erupted in different phases under submarine conditions.