Reflectance spectroscopy of mineralized and non-mineralized rocks of Machalu, Astore and its surroundings, Northern areas of Pakistan

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Abstract

Spectral reflectance of alteration zones associated with particular mineralization are very helpful in finding the absorption and reflectance features of different minerals present in them. These reflectance curves are not only useful for identification of minerals and rocks in the alteration zones but are also very important for selecting different bands for remote sensing analysis of the unknown and inaccessible areas. The reflectance spectra of different types of mineralized and non-mineralized rocks of Machalu, Astore and its surrounding areas of northern Pakistan were obtained in the spectral range of 0.35–2.5 µm through ASD Spectro radiometer. The fresh rock samples show low spectral reflectance as compared to the mineralized altered rock samples. The minerals jarosite, goethite and hematite show depth of absorption minima in the range of 0.4-1.15 (µm) due to the presence of Fe, while, jarosite and limonite show depth of absorption features at 2.2 and 2.26 (µm) due to the presence of OH^- ions. Clay minerals Illite, montmorillonite and muscovite are showing absorption features at 1.4 (µm) and 1.9 (µm) due to the presence of OH^- ions and H_2O, respectively. Calcite shows deep absorption minima at 2.32 (µm), while, the mineral anorthite shows absorption features at 1.4, 1.9, 2.24 and 2.33 (µm). Olivine shows a slight depressed absorption feature at 1.07. The copper minerals malachite, chrysocolla and azurite show a broad absorption feature in the range of 0.6-0.9 (µm), a small absorption at 1.4 (µm) and a deep absorption at 1.93 (µm), respectively. The non-mineralized samples are showing high reflectance bands in the range of 0.6-0.8, 1.6-1.9, 2.0-2.3, 2.1-2.25 and 2.4-2.5 (µm) wavelength, while, the mineralized samples are showing reflectance bands in the range of 0.4-0.6, 1.3-1.8 and 2.1-2.2 (µm) wavelength. Band 1, 2, 3, 4, 5 and 7 of Landsat-8 and Band 1, 2, 3, 6, 7 and 8 of ASTER were selected for processing the remote sensing images.