Multispectroscopic Applications for the Determination of Serpentine Minerals from Different Geologic Environments (SW-Turkey)

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Serpentine minerals (chrysotile, lizardite, antigorite) are an important mineral group in many ophiolites and are seen as alteration product of magnesium silicate minerals. In this study, two group serpentinite samples have been investigated from two different environments of the Yeşilova ophiolite suite in SW-Turkey. Group I samples were collected from the thrust zone in the tectonite unit. Group II samples belong to the marginal sections of the mafic dykes that cut the tectonite unit of the region. They have similar minero-petrographic properties which is showing xenomorphic granular and mesh texture and consisting of serpentine mineral (antigorite and lizardite) + pyroxene (augite) + Fe-Ti-Cr oxides (ilmenite, magnetite, chromite) ± relict olivine ± chlorite. These results are supported by XRD (X-Ray Diffractometer) and CRS (Confocal Raman Spectrometer).

The CRS investigations, most of the points on group I samples have antigorite composition, but some points on group II samples have lizardite peaks besides to antigorite peaks. According to the TGA results, weight loss of serpentinite samples range from % 8.49-16,74 (in group I) to % 13.15-19.28 (in group II). There are only exothermic peaks (816-820°C) in group I samples, whereas group II samples have slightly endothermic (614-650°C) and exothermic peaks (814-820°C) in DTA graphics. In addition, group I samples have high Al_2O_3 (0.01-1.37 wt. %), Fe_2O_3 (4.38-11.37 wt. %), SiO_2 (36.63-52.91 wt. %), TiO_2 (0.002-0.047 wt. %), Zr (3.6-5.7 ppm), Pb (0.6-1.4 ppm) and Th (0.8-1.5 ppm) concentrations, while Ni (1361-2157 ppm) and Sr (0.4-18.6 ppm) concentrations are high in group II samples.

Minero-petrographic, spectroscopic and geochemical data reveal that group I and II serpentine minerals have orginated from a harzburgite protolith which is serpentinized under different pressure and temperature conditions.

Keywords: Serpentinite, Thermal Gravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Confocal Raman Spectrometer (CRS)

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