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Use of Tourmaline as a Potential Petrogenetic Indicator in the Determination of Host Magma: CRS, XRD and PED-XRF Methods

Bahattin GULLU^{1,*} and Yusuf Kagan KADIOGLU²

Aksaray Univ. Engineering Faculty Department of Geological Engineering 68100 Aksaray TURKEY

Ankara Univ. Engineering Faculty Department of Geological Engineering 06100 Tandogan Ankara TURKEY

(bgullu@aksaray.edu.tr; kadi@ankara.edu.tr)

ABSTRACT Tourmaline defines a group of complex borosilicate forms as accessory mineral in igneous and metamorphic rocks and they act an important role in the interpretation of the chemical composition changes of the composition of the host fluid of the magma.

The variety of tourmaline can be identified by using optical microscopy, X-Ray Diffraction (XRD) and by determining its chemical composition through Polarized Energy Dispersive X-Ray Fluorescence (PED-XRF) methods. However, microscopic investigations and XRD analyses are not quite adequate for detailed determination of tourmaline sub-groups. In addition, the use of chemical composition of tourmaline as a strict indicator of geochemical processes might be a misleading method. In this study, variable tourmaline crystals were collected from three different pegmatitic occurrences in Behrekdag, Yozgat and Karakaya granitic bodies of Central Anatolia to identify their chemical properties through Confocal Raman Spectroscopy (CRS), PED-XRF and XRD analyses.

The confocal Raman spectrometry of collected tourmalines from the Behrekdag, Yozgat and Karakaya granites are in the compositions of schorl, schorl and elbaite respectively. The dominant compositional groups of these tourmalines are in the form of schorl. Raman shift values of tourmalines revealed four bands centered at almost 1050, 750, 400 and 300 cm^{-1} . The first group of the band arises from SiO stretching, the second from B-O stretching and the other two belong to bending modes of O-B-O and B-O-Al with symmetrical deformation of Si-O-Si. The strongest spectra near 360 cm^{-1} should belong to the bonding of Al-O. As a result, the confocal Raman studies are more sensitive for identification of tourmaline subgroup compositions and have a quite important in the explaining source of the magma.

KEYWORDS Confocal Raman spectroscopy, schorl-elbaite, tourmaline, Central Anatolia (Turkey)

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