The occurrences and mineralogical properties of fibrous tourmaline

*Yohei Shirose[1], Seiichiro Uehara[2]

1. The Kyoto University Museum, Kyoto University, 2. Department of Earth and Planetary Sciences, Graduate School of Sciences, Kyushu University

Tourmaline super group minerals are contained in various rocks like granites as accessary minerals. The general chemical formula is $XY_3Z_6(T_6O_{18})(BO_3)_3V_3W$ (X = Na, Ca, K, vacancy; Y = Fe^{2+}, Mg, Mn^{2+}, Al, Li, Fe^{3+}, Cr^{3+}; Z = Al, Fe^{3+}, Mg, Cr^{3+}; T = Si, Al, B; V = OH, O; W = OH, F, O), reflecting the chemical environment (Henry et al., 2011). Though tourmaline generally occurs as prismatic or granular shapes, it occasionally has a fibrous shape. Especially, alkali- deficient tourmaline such as foitite and magnesio-foitite occurs as fibrous shapes in many cases. Recently, Dutrow & Henry (2016) reinvestigated the fibrous tourmaline from various localities, and they indicated that the fibrous tourmaline was not only foitite and magnesio-foitite but also schorl, dravite, and elbaite. They also suggested the chemical compositions of fibrous tourmaline reflect the fluid compositions at tourmaline formation. In Japan, there are a lot of tourmaline localities, containing foitite and magnesio-foitite occurred from clay deposits, skarn deposits, vein deposits, and pegmatites, and Kyonosawa, Yamanashi Prefecture is a type locality of magnesio-foitite (e.g., Kato *et al.*, 1994; Hawthorne *et al.*, 1999). In this study, we investigated the occurrences and mineralogical properties of fibrous tourmaline from Li pegmatites and Li-bearing pegmatite in the Northwest Japan and the Inner Belt of Southwest Japan, and pegmatites, granites, and skarn deposits in the Outer Belt of Southwest Japan. Though, the detailed studies of the occurrences and chemical properties of tourmaline from Nagatare, Fukuoka Prefecture and Myokenzan, Ibaraki Prefecture were performed (e.g., Shirose & Uehara, 2013), fibrous tourmaline was not occurred in these Li pegmatites. In the Li pegmatite from Sakihama, Iwate Prefecture, fibrous tourmaline covered the termination of elbaite and tsilaisite crystals. In the pegmatite from Tanakamiyama, Shiga Prefecture, fibrous tourmaline of termination and fine hair-like tourmaline covered the surface of druse occurs with zinnwaldite and topaz. There are a lot of tourmaline occurrences in the granites and pegmatites from Takakumayama, Kagoshima Prefectures, Okueyama, Miyazaki Prefecture, and Otsuki, Kochi prefecture, derived from S-type granites. In the granites and pegmatites from Takakumayama, Okueyama, Otsuki, fine prismatic tourmaline occur in the cavity, and terminations of black tourmaline from Takakumayama and Otsuki had fibrous terminations. The Obira mine, Oita Prefecture, skarn deposit derived from the Okue granites, has abundant boron minerals as tourmaline and danburite. Black tourmaline with fibrous termination and quartz including fibrous tourmaline occurs in the Obira mine. The prismatic crystals are 100-200 μm in diameter and 2-6 mm in length (length to width ratio 20-30), and the fibrous termination of tourmaline are 10-30 μm in diameter and 150-1000 μm in length (length to width ratio 15-30). The fine hair-like tourmaline from Tanakamiyama has different properties with 100 nm in diameter and 50 μm in length (length to width ratio 500).The tourmaline from Takakumayama, Okueyama, and Otsuki is Fe-rich and Mg bearing in the Y site, and Na and vacancy-rich in the X site with minor Ca (< 0.15 apfu). For the tourmaline from Tanakamiyama and Sakihama contain abundant Fe in the Y site, and Na and vacancy in the X site without Ca. The textures of the fibrous termination tourmaline from Otsuki and the Obira mine in the BSE images show the dissolution of pyramid termination and recrystalization along the c axis. Primary tourmaline is reacted under the low pressures condition with non-equilibrium fluids, and fibrous tourmaline epitaxially crystalize under metastable conditions. Finally, fine prismatic tourmaline crystalize under oversaturation. The nanofiber tourmaline from Tanakamiyama is considered that they are crystalized under vapor-phase growth.

