Chemical and boron isotopic composition of tourmaline and muscovite in granite and pegmatite from Cizhu pluton, Jiangxi Province, South China: insight to magmatic-hydrothermal evolution

MING-YU CAO, SHAO-YONG JIANG, HUI-MIN SU, KUI-DONG ZHAO, WEI CHEN

State Key Laboratory of Geological Processes and Mineral Resources, Faculty of Earth Resources, China University of Geosciences, Wuhan 430074, China (shyjiang@cug.edu.cn)

Tourmaline occurs in granite and pegmatite in the Cizhu pluton in Jiangxi Province, South China. In this study, we analyzed chemical and boron isotopic compositions of both tourmaline and muscovite by EPMA and LA-MC-ICP-MS methods. The tourmalines belong to schorl-dravite, with B-isotope ratios range from −11.5 to −17.0‰, typical for continental crust. The boron isotopic compositions of tourmaline in granite vary from −11.5 to −12.5‰ (average −12.0‰), with no systematic variation between the cores and the rims even though they show clear Mg/(Fe+Mg) differences, which is considered to indicating tourmaline formation during a single magmatic-hydrothermal stage, approximating the composition of bulk magma, with the granitic melt being evolved to more Mg-rich from Fe-rich composition. The tourmalines from the basement metamorphic rocks have indistinguishable boron isotopes (average −11.9‰) with the granite, suggesting that the boron source of the Cizhu granitc pluton was likely derived from anatexis of the local basement rocks. The tourmalines from pegmatite and hydrothermal vein have a higher Mg/(Fe+Mg) ratios and slightly lower $\delta^{11}B$ values of −13.7 to −15.4‰ (average −14.6‰) in pegmatite and −15.2 to −17.0‰ (average −16.0‰) in hydrothermal vein, suggesting a more evolved pegmatitic magma or an exsolved boron-rich fluid in the granitic system. The $\delta^{11}B$ of muscovite (−12.9 to −22.4‰, average −17.0‰) in granite demonstrate that boron isotopes are strongly fractionated between mica and tourmaline, with being ~5.0‰ lower than coexisting tourmaline, which are consistent with previous studies and theoretical fractionation prediction.