Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.11608

Major, trace element and boron isotope in tourmaline from the Malage tin deposit in the Gejiu ore district, South China: implications for fluid evolution

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The Malage tin deposit are related to Cretaceous granite and accompanying hydrothermal activity. To understand the formation of this deposit, fluid evolution is of great importance. Tourmaline is a good recorder of the mineralization processes as it is a mineral crystallized during the whole stages. Tourmalines are equipped to adjust their compositions to record geologic information on condition where they formed.

Three types of tourmaline have been identified in the Malage tin deposit (in the north part of the Gejiu ore district). Type 1 tourmaline occurs as tourmaline-quartz nodules in the granite. Type 2 tourmaline occurs as tourmaline-quartz veins in the granite. Type 3 tourmaline occurs as ore veins in the carbonate strata and has obviously oscillatory zoning.

All tourmalines show a wide range of major element concentrations with Mg/(Mg+Fe) ratios of 0.00~0.69 and Na/(Na+Ca) ratios of 0.28~1.00. Tourmalines present a shift from schorl to dravite from early magmatic tourmaline to late hydrothermal tourmaline, representing the compositions of early tourmaline is controlled by Fe-rich granitic magma and the compositions of late tourmaline is controlled by host rock. V, Sc, Ni and Co mainly partition into the early tourmaline, whereas Sr, Li, Zn partitions preferably into the late tourmaline. The Strontium content in late tourmaline can reach thousands of ppm, which reveals that Sr came from the carbonate strata. The boron isotopic compositions of tourmaline vary from -16.0‰ to -13.3‰, revealing that the hydrothermal fluids were originated from the granitic magma [1]. In general, the ore-forming fluids in the Malage tin deposit have a magmatic-hydrothermal origin, and have strongly interacted with the carbonate , resulting in the change of fluid composition from Fe-rich to Mg- and Ca-rich.

[1] Jiang et al. (1998) EUR J MINERAL 10, 1253-1265.