Chemical and B-isotope composition of tourmaline from Bagjata uranium deposit, Singhbhum Shear Zone, India: implications for source of mineralizing fluids

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The Bagjata uranium deposit is located at the eastern most part of the Singhbhum Shear Zone (SSZ). The current study is based on chemical and B-isotope composition of tourmalines, texturally associated with uraninite from the schistose host rocks of Bagjata to characterize the sources and evolution of the mineralizing fluids. Microtextural relations classify the tourmalines into two types. The earlier ones that occur as irregular patches are of dravite and schorl composition forming the tourmaline cores. The later types that pseudomorphically replace the earlier cores preserve composition that straddle the dravite–schorl join. Variation in the HREE contents and B-isotopic values between dravite ($\delta^{11}B$ ca. +8 ‰) and schorl ($\delta^{11}B$ ca. +2 ‰) indicate two compositionally distinct hydrothermal fluids, from which the tourmalines of two generations precipitated, with Na content varying between 0.8 and 0.5 apfu. The positive correlation between $\delta^{11}B$ and X_{Mg} of tourmalines suggest the interaction of high saline fluids with the host schistose rocks, wherein the earliest tourmalines with higher $\delta^{11}B$ and X_{Mg} values precipitated. These tourmalines have high Na in the X-sites. Continued fluid-rock interaction and biotite dissolution from the schistose rocks reduced the fluid salinity and made it isotopically lighter. The Fe-rich/Na-depleted isotopically lighter later tourmalines precipitated from these evolved fluids [1]. The isotopically heavier and saline fluids were derived from the subducting slab, consistent with the subduction zone setting for the rocks of the SSZ [2]. The ^{11}B-depleted-low saline fluids, on the other hand, either formed by fluid-metapelite interaction or from pelitic host rocks that underwent metamorphic devolatilization.

[1] Orlando et al., 2017 *Minerals* **7**, 155; [2] Rekha et al., 2011 *Precam. Res.* **187**, 313–333.