Geochemistry and boron isotopic compositions of tourmaline from the Paleoproterozoic amphibolites, NE China: Implications for the origin of borate deposit

ZHIQIANG WANG[1], BIN CHEN[2], XUELONG YAN[3]

[1] School of Resources and Environmental Engineering, Hefei University of Technology, Hefei 230009, Anhui, China
[2] Department of Earth and Space Sciences, Southern University of Science and Technology, Shenzhen 518055, Guangdong, China
[3] Wanbao Mining LTD., Beijing 100035, China

The Paleoproterozoic metasediments and metavolcanics in the Jiao-Liao-Ji belt, northeastern China, host a large number of borate deposits. To trace the source of boron in these borate deposits, we carried out *in situ* chemical and boron isotopic studies on tourmalines of amphibolites from the Lieryu Formation of the Liaohe Group in the Jiao-Liao-Ji belt.

The petrology and the chemical compositions of tourmalines of amphibolites show that these tourmalines formed by influx of B-rich fluids during different stages of metamorphism. The δ^{11}B values of tourmaline continue to decline during the successive metamorphism. Tourmalines that formed during the prograde metamorphism show higher δ^{11}B values (+9.52~+10.18‰) than those formed during the peak metamorphism of amphibolite facies (+7.22~+9.43‰). Subsequently, tourmalines with lower δ^{11}B values formed during the retrograde metamorphism of greenschist facies, which have slightly different boron isotopic compositions in cores (+4.18~+5.50‰) and rims (+2.66~+4.66‰), mainly due to the temperature effect.

We did modeling study on the boron isotopic variations of marine sediments during prograde metamorphic dehydration. The calculated boron isotopic compositions of dehydrated fluids match well with the boron isotopic variations of tourmalines of amphibolites, suggesting that tourmalines may be precipitated from fluids released from dehydration of marine sediments with relative high δ^{11}B values (+9‰) during the prograde metamorphism. In the same way, the borate deposits formed from the liberated B-rich fluids that interacted with the Mg-rich carbonates and/or silicates.