

Major and trace elements of biotites

The electron probe microanalysis of biotites in the granodiorite porphyry and mafic enclaves were carried out using a JEOL JXA-8100 equipped with an Oxford Inca-X20 energy-dispersive spectroscope (EDS) at the Guangzhou Institute of Geochemistry, Chinese Academy of Sciences (GIG-CAS). The working conditions were: 15 kV accelerating voltage, 20 nA beam current, 5 μm beam diameter, and a ZAF correction procedure for data reduction. The detection limits for all elements were lower than 300 ppm. The following natural and synthetic standards were used: K-feldspar (for Si, K), apatite (for F), olivine (for Fe), albite (for Na, Al), MnO (for Mn), kaersutite (for Ti), pyrope garnet (for Mg, Ca), and tugtupite (for Cl). Chemical formulas of micas were calculated based on 24 anions (O, F, OH). The Li_2O content of micas was calculated following Tischendorf et al. (1997), and H_2O was calculated following Tindle and Webb (1990).

Trace element analysis of minerals was conducted by LA-ICP-MS at the Guangzhou Tuoyan Analytical Technology Co., Ltd., Guangzhou, China. Laser sampling was performed using a NWR ablation system (wavelength of 193 nm). An iCAP RQ ICP-MS instrument was used to acquire ion-signal intensities. Helium was applied as a carrier gas. Argon was used as the make-up gas and mixed with the carrier gas via a Y-connector before entering the ICP. A “wire” signal smoothing device is included in this laser ablation system. A spot size of 30 μm , a repetition rate of 8 Hz, and a maximum energy of 90 mJ were applied during the analysis. Trace element compositions of minerals were calibrated against various reference materials (NIST 610, NIST 612 and BHVO-2G) with Si the internal standards. Each analysis incorporated a background acquisition of approximately 50 s followed by 40 s of data acquisition from the sample. An Excel-based software ilolite was used to perform off-line selection and integration of background and analyzed signals, time-drift correction and quantitative calibration for trace element analysis. The detection limits of LA-ICP-MS range from 0.002 ppm for REE to 1 ppm for Ni. Repeat analysis on standards NIST 612 and BHVO-2G indicate that both precision and accuracy are better than 5% for most of the elements analyzed. For mica, the relative standard deviations Nb, Ta, W, and Sn are better than 1%; those of REE, Th, U, and Pb range from 20 to 30%.

References

- Tischendorf, G., Gottesmann, B., Foerster, H.J. and Trumbull, R.B. (1997) On Li-bearing micas: estimating Li from electron microprobe analyses and an improved diagram for graphical representation. *Mineralogical Magazine*, 61, 809–834.
- Tindle, A.G., and Webb, P.C. (1990) Estimation of lithium contents in trioctahedral micas using microprobe data: application to micas from granitic rocks. *European Journal of Mineralogy*, 2, 595-610.