Major- and trace-element zoning patterns in retrograde overprinted phengite and sodic amphibole as tracers of subduction zone fluids

Konrad-Schmolke, Matthias[1] Zack, Thomas[2] Marschall, Horst[3] Barth, Matthias[4]
[1]Universität Potsdam [2]Universität Heidelberg [3]University of Bristol [4]Universität Mainz

Phengite and sodic amphibole grains in metapelitic and metabasic high pressure rocks throughout the Sesia-Lanzo Zone (SLZ; Western Alps) have pronounced compositional zonations with respect to major- and trace- elements. Amphibole grains show a distinct increase in Fe2+ content associated with a Mg-decrease. Phengites show a characteristic change towards more celadonitic compositions. Chemical modification of the mineral grains is visible in high contrast back scattered electron images, occurs along grain boundaries, fractures and other fluid pathways and is often restricted to clearly separated narrow zones with step-like compositional gradients towards the pristine cores of the grains. Thermodynamic forward models show that the observed compositional trends in amphibole and phengite are the result of influx of a hydrous fluid phase at around 1.5 GPa during the exhumation of the SLZ.
The trace element zoning patterns differ between the metapelitic and metabasic samples. In the metapelites phengite rims have lower concentrations of B, Pb, Sr, Li, Ti and Be with respect to the cores. Amphiboles show lower B and Sr, but higher Li and Be concentrations in the rims than in the cores. In the metabasites phengites show the same trend as in the metapelites, but amphibole have decreasing Sr, Pb and Li from core to rim associated with constant or increasing B concentrations. Ion microprobe measurements of δ^{11}B values in the compositionally zoned phengites yielded a complex pattern of core-rim differences depending on sample chemistry. Whereas δ^{11}B values in the metapelites show only slight core-to-rim variations and are between -10 and -15 ‰, δ^{11}B values in the phengite rims of the metabasic rocks are up to 10 ‰ higher than in the non-overprinted cores and reach values around -5 ‰.
Trace element zonation patterns as well as δ^{11}B values in our samples suggest massive influx of an externally derived fluid phase at lower crustal depths during the syn-convergent exhumation of the SLZ. According to the tectonic setting during the exhumation of the SLZ it is likely that the fluid influx occurred in the hanging wall of a subducted oceanic slab, thus reflecting fluid-triggered element cycling at the base of the mantle wedge in a paleo-subduction zone.

→

Abs. No. **387**
Meeting: **DMG 2008**
submitted by: **Konrad-Schmolke, Matthias**
email: **mkonrad@geo.uni-potsdam.de**
date: **2008-06-02**
Req. presentation: **Vortrag**
Req. session: **S05**