Mineral compositions as a function of contact metamorphism: a case study from metapelites from the Permian contact aureole of the Southalpine Brixen granodiorite (S-Tyrol/Italy)

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In the Southalpine domain, the Permian intrusive complexes of the Brixen-, Iffinger- and Kreuzberg granitic-granodioritic plutons are aligned along the Periadriatic Lineament, and cover an area of ca. 200 km^2. Contact aureoles have been identified at the southern rims of all three plutons but no *P-T-t* data are available from any of the contact aureoles so far. Although the chemical evolution of these intrusive bodies is well established, and contact aureoles were identified and partly mapped at the turn of the last century, there are almost no quantitative mineral chemical data available from any of the contact aureoles.

It is one of the aims of this investigation to obtain systematic electron microprobe analysis of the minerals of the contact metamorphic quartzphyllites and the surrounding regionally metamorphosed Southalpine basement. These data are the prerequisite for subsequent thermobarometric investigations. Electron microprobe analysis also allows identification of chemical variations of mineral composition as a function of distance from the contact. This involves systematic analysis of minerals from zones with increasing metamorphic grades. Pattison and Harte (1991) showed that Mg/(Mg+Fe), K/(K+Na) and MgSi = $Al_{-1}Al_{-1}$(Tschermaks substitution) show systematic variations with increasing grade.

Besides textural evidence, the first chemical evidence of contact metamorphism can be found in newly grown biotite and muscovite from the outer contact aureole (ca. 300 m from the contact). These biotites are titanium-enriched (1.5 wt. % TiO_2) compared to biotites from the thermally unmetamorphosed Brixen Quarzphylite, which contain 0.3 wt. % TiO_2. Newly grown muscovite also shows higher paragonite component, than muscovite from the relict foliation. Approaching the intrusion, the Ti-contents of biotite increases to values of about 3.5 wt. % TiO_2 in the innermost (within 1 m from the contact) part of the contact aureole. A systematic chemical variation of plagioclase composition was also observed. The thermally unmetamorphsed Brixen Quartzphyllites contain almost pure albite (An < 2 mol. %). In the outer contact aureole, the anorthite contents increase to ca. 20 mol. % An-component. In the inner (within 50 m from the contact) part of the contact aureole, plagioclase contains up to 40 mol. % An-component and in the innermost contact aureole (<1 m from the granite contact) the anorthite content increases to 45 mol. % An. Calculation of temperature by using two-feldspar thermometry with the program SOLVCALC (Shaoxiong and Nekvasil, 1994) also yields an increase in temperature from 550 °C to 620 °C from the inner- to the innermost contact aureole. In contrast to biotite and

plagioclase, cordierite shows no systematic variation in MgO, FeO and Na_2O which might be due to additional factors such as different bulk compositions and variations in $a(H_2O)$. In the innermost part of the contact aureole, spinel occurs. The spinel contains 28.5 wt. % FeO and 10 wt. % ZnO.

Shaoxiong, W., Nekvasil, H. (1994): Computers & Geosciences Vol. 20, No. 6, 1025-1040

Pattison, D.R.M. and Harte, B. (1991): in: Voll, G., Töpel, J., Pattison, D.R.M., Harte, B. (eds.) Equilibrium and Kinetics in Contact Metamorphism, Springer Verlag, 135-180.