

THERMODYNAMIC MODELLING OF IN-SITU ECLOGITIZATION OF METAPELITES FROM VAL SAVENCA (SEZIA ZONE, WESTERN ALPS)

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A common feature of HP and UHP terranes is the subduction of lower crustal rocks to great depths. Previous investigations have shown that this process is triggered by fluids present during an eclogite-facies metamorphic overprint. Key examples of these processes is exposed in the metapelites at Val Savenca and the metagranites of Monte Mucrone, both in the Sesia-Lanzo Zone, Italy, where Alpine eclogite-facies metamorphism and fluid flow led to partial transformation of Variscan amphibolite-eclogite facies metapelites (garnet + biotite + sillimanite + K-feldspar + plagioclase + quartz) and metagranites (garnet + biotite + K-feldspar + plagioclase + quartz) to zoisite ± jadeite + kyanite + phengite + quartz with associated jadeite veins. This transformation took place under *P-T* conditions of 1.7 – 2.1 GPa at 600 °C and low $a(\text{H}_2\text{O})$ of 0.3-0.6. The textures in the Val Savenca metapelites show relict igneous biotite which is rimmed by a thin rind of garnet. The replacement of plagioclase by jadeite + zoisite + kyanite + quartz takes place also along former fractures. Within the jadeite + zoisite + kyanite + K-feldspar pseudomorphs after plagioclase, jadeite and quartz coexist with K-feldspar. Jadeite also shows some late stage replacement by omphacite at the rims, which was also observed in jadeite-rich veins in adjacent samples. Biotite is replaced by the assemblage phengite + omphacite ± kyanite if it is adjacent to former plagioclase, otherwise by phengite + rutile/titanite, or only by phengite. These omphacitic areas contain no zoisite. Former metamorphic K-feldspar seems to recrystallize during Alpine metamorphism, as suggested by development of a homogeneous host with included needles of zoisite and jadeite. The extreme development of microdomains can best be studied by investigating garnet and clinopyroxene zoning. Garnet grows in two generations, namely garnet from the primary assemblage and garnet growing around biotite is pyrope-rich. The grossular content increases during the Alpine metamorphic overprint and garnets growing adjacent to plagioclase domains are very grossular-rich. Clinopyroxenes also show strong compositional variations depending on the microdomain in which they grew. The compositions range from jadeite (>90% Jd) to omphacite (ca. 40% Jd). Thermodynamic modelling of individual microdomains was done by calculating pseudosections of stoichiometric mixtures of protolith minerals using the program DOMINO (DE CAPITANI & PETRAKAKIS, 2010). Protolith plagioclase composition was calculated using image analysis and yielded a plagioclase composition ranging between 30% and 50% anorthite component. The aim of the pseudosection calculations was two-fold: 1.) to reproduce the observed mineral assemblage and 2.) to provide constraints on the amount of fluid present in the transformation. The results so far indicate that the amount of fluid was low, otherwise paragonite would have formed instead of jadeite in the plagioclase domains. Reproduction of the observed mineral assemblage has only been partly successful so far since biotite is still stable in the calculations.

DE CAPITANI, C., PETRAKAKIS, K. (2010): *American Mineralogist*, 95, 1006–1016.