METAMORPHIC EVOLUTION OF FE-RICH MAFIC CUMULATES FROM THE ÖTZTAL-STUBAI CRYSTALLINE BASEMENT, EASTERN ALPS, AUSTRIA

J. Konzett (1), Richard A. Armstrong (2), Ch. Miller(1), M. Thöni (3)
(1) Institut für Mineralogie und Petrographie, Universität Innsbruck, (2) Research School of Earth Sciences, The Australian National University, (3) Institut für Geologie, Universität Wien (juergen.konzett@uibk.ac.at)

Within the Austroalpine Ötztal-Stubai Crystalline Basement (ÖSCB), lenses of mafic rocks intercalated with eclogites are present containing an assemblage of olivine (Fo$_{0.79-0.86}$) + orthopyroxene + spinel + amphibole ± garnet ± clinopyroxene. They are interpreted as olivine-rich cumulates generated from a differentiated Fe-rich tholeiitic magma. These rocks contain layers with an assemblage garnet + clinopyroxene + corundum + högbomite + Ti-phases. U-Pb SHRIMP dating of zircons from a garnet layer yields a concordant age population of 517 ± 7 Ma. Subsequent Pb-loss/rejuvenation is indicated by younger ages extending to 376 ± 6 Ma. The age derived from the concordant age group is in good agreement with a Sm-Nd age of 530–521 Ma for gabbroic eclogite precursor rocks from the ÖSCB which suggests a genetic relation between the MORB-type plagioclase-rich eclogite precursors and the plagioclase-free olivine-rich mafic cumulates of the present study. Garnet layers are thought to have formed through a reaction spinel + plagioclase = garnet + corundum + clinopyroxene from plagioclase-spinel-rich layers within the olivine-rich rock body during Hercynian metamorphism. This would be consistent with positive Eu-anomalies in garnet and clinopyroxene. Peak metamorphic conditions derived from eclogites intercalated with the mafic cumulates are 730°C/ca. 27 kbar. Al-in-opx thermometry applied to orthopyroxenes from olivine-rich cumulates yields 800–830°C which is thought to record the T-peak of the Hercynian metamorphic event. PT-conditions of the garnet peridotite stability field are indicated in the olivine-rich
cumulates by garnet coronas around spinel and newly formed olivine indicative of a reaction spinel + clinopyroxene + orthopyroxene = garnet + olivine. Corona-garnets are significantly less calcic than layer-garnets, again suggesting the formation of the garnet layers from a Ca-rich precursor, such as plagioclase. Retrogressive hydration led to the formation of an extremely Cl- and incompatible element enriched secondary assemblage developed along the interface of garnet layers and the olivine rich rock body, containing Cl-rich pargasite with up to 3.5 wt% Cl and Cl-Sr-apatite with up to 6.5 wt% Cl and 3.9 wt% SrO. This Cl-rich assemblage is thought to have formed by progressive desiccation in stationary fluid pockets of originally Cl-poor fluid.