Monazite-in reaction in eclogite: insight from *HP-LT* rocks from Svalbard

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Monazite is a common mineral in metamorphic rocks, but is rarely found in metabasites (Schulze *et al.,* 2015). Thus, monazite discovered in high-pressure low-temperature (*HP-LT*) eclogites from the Vestgötabreen Complex, SW Svalbard and one of the most northern exposures of Paleozoic *HP-LT* rocks (Agard *et al.,* 2005) is unique. We apply a combination of geothermobarometry together with multi-mineral geochronology to better constrain the pressure-temperature-time (P-T-t) evolution of blueschists and eclogites. Zoning in garnet, omphacite and white mica shows three evolutionary stages for eclogite: the prograde growth (M1) at 15.9 kbar and 460°C, followed by the peak-*P* conditions (M2) of 23.5 kbar at 507°C and peak-*T* conditions (M3) of 21.4 kbar at 553°C. *P-T* estimates for blueschist gives the peak conditions of ca. 18 kbar at 520-550°C.

Monazite occurs in the eclogite as inclusions (<30 μm) within garnet rims as well as in the matrix. Monazite inclusions are rimmed by apatite and allanite. The matrix monazite forms aggregates (<50 μm) within tabular-shaped pseudomorphs (up to 500 μm) composed of apatite, allanite and epidote. Monazite in thin section analyzed by SIMS yields a $^{206}Pb/^{238}U$ weighted mean age of 471±6 Ma (n=7, MSWD=1.4). To better interpret the time frame for monazite formation, zircon and garnet were dated for the same eclogite. Analyses of zircon rims give the lower intercept of concordia at 478±17 Ma (n=11, MSWD=1.1). The oldest fractions of garnet yield the Lu-Hf age of ca. 471 Ma, whereas bulk garnet separates are ca. 466 Ma. Due to the high Lu concentration in the rims, the ages are probably biased towards the rim. Lu-Hf garnet dating for the blueschist indicates the age of ca. 471 Ma.

These results provide more insight into the metamorphic evolution of the Vestgötabreen Complex and allow identification of the monazite-in reaction in mafic rocks. M1 stage indicates garnet-I growth on the prograde path at 478-470 Ma for blueschist and eclogite. M2 plots at the border of the lawsonite-eclogite facies and may imply the conditions of lawsonite decomposition. Since lawsonite is the main carrier of LREE in *HP-LT* rocks (Martin *et al.,* 2014), the unusual occurrence of monazite in the eclogite is inferred to record the lawsonite-out reaction at ~471 Ma. M3 represents garnet rim growth at <466 Ma and the concurrent monazite breakdown to allanite and apatite coronas.

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