# Interpretation of trace element zoning patterns of metamorphic garnets from cold subduction setting

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Water release from the oceanic crust is an essential factor for arc magmatism and subsequent seismicity in subduction zone. The maximum water release occurs at the transition from blueschist to eclogite facies, especially if lawsonite is breaking down in cold subduction zones. Lawsonite is able to carry up to 11.5 wt.% $H_2O$ and can be stable up to 300 km depth. Thus, tracing lawsonite breakdown in exhumed high- and ultrahigh-pressure rocks gives insight into the pressure, temperature and dehydration history of the subducted slab. However, lawsonite is rarely preserved in surface rocks, as it is prone to retrogression during exhumation.

We examine the distribution of trace elements in a suite of high pressure/low temperature samples in order to identify characteristic rare earth elements patterns in garnet in order to interpret these in terms of mineral breakdown reactions (especially lawsonite, garnet, titanite and epidote) during the rocks‘ prograde evolution. Garnet is suitable for such an approach as it is common in HP/LT rocks, efficient in preserving REE growth zonations and it is incorporating significant amounts of trace elements, especially rare earth elements (REE) and yttrium. Furthemore, slow diffusion of such elements enables to preserve thermodynamic conditions via compositional growth zonation.

According to Ditterova *et al.* [1], garnet from cold (lawsonite-stable) subduction setting exhibit characteristic REE pattern. Heavy REE are enriched in garnet’s core and they decrease in bell-shaped manner towards its rim, where they create two high peaks as a result of epidote and amphibole breakdown. The higher atomic number (Z) is, the higher core’s peak, but lower rim’s peak the element has. Medium REE exhibit bowl- to w-shaped patterns, the height of their peaks is proportional to Z. Our data are, in general, in agreement with such trends for all HP/LT samples, however, we show that titanite breakdown and onset of rutile growth can also result in similar rim’s peak signature that can be used to infer the particular mineral reactions.

[1] Ditterova *et al.* (2015) *Goldschmidt Abstracts* ***747***.