

## Crystal habit change, observed in pyralspite garnets from Bohemian HT metapelite and its significance.

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It is generally considered that the crystal habit change in minerals is mostly caused by a change of external conditions during the crystal growth. The technology crystallizing dodecahedral or trisoctahedron Grt has been established by controlling flux compositions (e.g. Chase and Osmer, 1969). In the nature, Grt grains showing crystal habit change are mostly found from contact metamorphic rocks, e.g. Jamtveit and Andersen (1992) proposed that the crystal habit change of Grt was caused by fluid-infiltration and rapid heating. In this study, Grt grains showing crystal habit change were newly found from Bohemian HT metapelite, which accompanies with various kinds of partial melting structures such as leucosomes and leucocratic veins. The characteristic matrix mineral assemblage in this rock is Qtz+Kfs+Crd+Sil+Bt+Grt. Sil occurs both as an inclusion phase in Grt and as a matrix phase. Ky is identified only as an inclusion phase in the rim of Grt, but it is not found from the matrix. Most of fine-grained (0.8 mm) and coarse-grained (more than 3 mm) Grt are homogeneous in composition. However, some coarse-grained Grt shows a chemical heterogeneity both in major and trace elements; Grs-content is homogeneous and high ( $X_{\text{grs}}=0.27$ ) in an apparent core of the grain and continuously decreases towards the rim ( $X_{\text{grs}}=0.02$ ). However, Prp-content shows a contrast pattern against Grs-content, i.e., Prp content low and constant ( $X_{\text{prp}}=0.03$ ) in the core, and gradually increases towards the rim (up to  $X_{\text{prp}}=0.28$ ). The outlines of Grs and Prp content contour show a symmetrical hexagonal shape. Phosphorous (P)-content is almost below the detection limit of EPMA in the apparent core but it is significantly concentrated at the margin of grain with local development of P-poor most outer rim. The outline of P-poor core shows a hexagonal shape, as similar as those of Grs and Prp content contour. There is discordance between the position of the outer most edge of P-poor core and the core/rim boundary determined by Grs content. The outline of P-content contour in P-rich rim shows an octagonal shape. Tiny fluid inclusions rich in CO<sub>2</sub>-N<sub>2</sub> are abundant in P-poor core but are lacking in the P-rich rim. Crystal index of P-poor core and P-rich rim are determined with EBSD. P-poor part shows dodecahedral surfaces {110} and P-rich margin shows trisoctahedron surfaces {211}. A tentative use of the GASP geobarometer gives 1.4GPa at 600°C and 2.2GPa at 900°C assuming for the Grt core + Ky assemblage in the early stage of the metamorphism. The geothermobarometers evaluate 730-830°C and 1.0-1.3GPa for the Grt inner rim stage, and 740-850°C and 0.6-0.8GPa for the matrix stage. Estimated P-T conditions and petrogenetic grid suggest that study rock was took place the isothermal decompression from the Grt core stage (1.4-2.2GPa) to the matrix stage (0.6-0.8GPa), accompanying with partial melting at Grt inner rim-forming stage. Timing of crystal habit change corresponds to the beginning of the growth of P-rich rim. P-poor core includes Apt and Mnz, but the P-richest rim is lack of them. Similar zoning pattern of P in Grt was reported from HT metapelite, formed at 750-900°C and 0.5-1.0GPa, from Antarctica and Sri Lanka (e.g. Hiroi et al., 1997), who considered that P-rich Grt was formed by a partial melting reaction accompanying with phosphate during HT metamorphism. Therefore, P-rich melt may be produced at inner rim forming stage, and may supply P to the rim of Grt, because of the similarity of P-T conditions for P-rich Grt formation and of zoning pattern of P in Grt. It is suggested that the crystal habit change of Grt can be caused by the environment change from fluid to partial melt accompanying with the decompression. This study shows that chemical zoned mapping of P is a potential tool for finding crystal habit change in Grt. It can be expected that the Grt showing a crystal habit change will be commonly found from HT metamorphic belt by this method.