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Nanogranitoids in garnet clinopyroxenites of the Granulitgebirge (Bohemian Massif): evidence for metasomatism and partial melting?

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Primary nanogranitoids occur in garnet from the garnet clinopyroxenites of the Granulitgebirge, Bohemian Massif. They form clusters in the inner part of the garnet, and may occur both as polycrystalline and glassy inclusions with size from 5 to 20 μm. Because of their random distribution in garnet these inclusions are interpreted as primary inclusions, thus formed during the growth of the garnet. Garnet does not show any major element zoning. Nanogranitoids were identified in garnet clinopyroxenites from two different locations and show slightly different mineral assemblages. Kumdykolite or albite, phlogopite, osumilite, kokchetavite and a variable amount of quartz occur in both locations. However, osumilite is more abundant in one locality and kokchetavite in the other. All these phases are identified using Raman Spectroscopy.

Both assemblages are consistent with the origin of these inclusions as former droplets of melt. Nanogranitoids from one locality have been re-homogenized at 1000°C and 22 kbar to a hydrous glass of granodioritic/quartz-monzonitic composition in a piston cylinder apparatus. The chosen experimental conditions correspond to the formation of the host garnet (O'Brien & Rötzler, 2003) and thus of melt entrapment.

Nanogranitoid-bearing garnet clinopyroxenites occur in bodies of serpentinized peridotites, hosted in turn in felsic granulites. The garnet clinopyroxenites show granoblastic texture dominated by garnet and clinopyroxene porphyroblasts with a variable amount of interstitial plagioclase, biotite, two generations of amphiboles (brown and green) and rutile and opaque minerals as accessories. The bulk rock composition is basic to intermediate, and the garnet chemistry varies from 24% Alm, 65% Prp and 11% Grs to 38% Alm, 36% Prp and 26 % Grs between one outcrop and the other.

The origin of the investigated inclusions could be due to different processes: localized melting of metasomatized mafic rocks with simultaneous production of garnet or an interaction between melted felsic granulites and metasomatized peridotites with consequent formation of these garnet clinopyroxenites. Further re-homogenization experiments will better constrain P-T entrapment conditions and the melt compositions. Trace elements analyses will be performed both on bulk rock and nanogranitoids to identify protolith and reactants of the melting reaction responsible for the production of the trapped melt.

O'Brien PJ & Rötzler J. (2003) – High-pressure granulites: formation, recovery of peak conditions and implications for tectonics. Journal of Metamorphic Geology, 21, pp. 3-20.