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Decrepitation Halos and Oriented Lamellae in Garnets from diamondiferous Gneiss, Saxonian Erzgebirge

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Record on UHP event in diamondiferous gneisses of Saxonian Erzgebirege is preserved only within inclusions in strong refractory minerals like garnet, zircon and diamond. Here we discuss origin of unusual inclusions in garnet which provide evidence on the both (1) presence of supercritical UHP liquid in the rock and (2) non precipitated origin of oriented lamellae in the garnet host.

The studied dimondiferrous gneiss is composed of garnet, phengite (replaced by retrograde biotite), plagioclase and quartz as major rock-forming minerals. Garnet often contains polyphase diamond-bearing inclusions consisting of quartz±phengite±phlogopite±rutile±titanite±apatite. We found that relatively large polyphase inclusions (100-200 μm in diameter) in one of the garnet crystals show a tendency to negative crystal shape with radial fractures. In addition, the inclusions are surrounded by *halos* consisting of numerous inclusions of size less than 1 μm. The halos are well visible in the optical microscope but indistinguishable (due to the small size of individual inclusions) neither by scanning electron microscope nor by electron microprobe. Morphology of the halos is identical to the well known *decrepitation halos* of melt and fluid inclusions in deep seated magmatic rocks suggesting similar mechanism of their formation. Indeed, according to the phase relations in the "muscovite granite-H_2O" system, supercritical liquid contains high amount of silicate (melt) component and low amount of fluid component at the P-T conditions of diamond-bearing gneiss. Owing to low viscosity of such liquid under UPH conditions the inclusions may decrepitate during their pathway to the Earth's surface. In turn, it is hard to explain origin of halos in terms of solid state re-crystallization.

Most of garnet grains contain very tiny oriented needles (up to 2*200 μm) of rutile as

well of Na- and K-Mg phases (stoichiometries are not clear at this stage of research). Since precipitation of K-Mg phase is impossible from the K-free garnet (below 10 GPa), the source of K should be located out of the garnet structure. Moreover, all the phases may produce intergrowth in a single lamella providing further evidence of exterior source of material for lamellae. Accordingly we assume that these oriented inclusions are not precipitated from the garnet host but resulted from interaction between garnet and coexisting supercritical liquids situated either in the matrix of the rock, or in the inclusions in garnet during the rock exhumation.