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The role of fluid in the formation of garnet coronas in isobarically-cooled mafic granulites: an example from southern West Greenland.

A. Dziggel (1), J.F.A. Diener (2), N.B. Stoltz (1), and J. Kolb (3)

(1) Institute of Mineralogy and Economic Geology, RWTH Aachen University, Aachen, Germany (adziggel@iml.rwth-aachen.de), (2) Department of Geological Sciences, University of Cape Town, Cape Town, South Africa, (3) Department of Petrology and Economic Geology, Geological Survey of Denmark and Greenland, Copenhagen, Denmark

The presence of coronitic garnet or garnet-quartz symplectites is a typical texture observed in isobarically cooled mafic granulites and suggested to form through isobaric cooling. Here we investigate the metamorphic evolution of two-pyroxene mafic granulites from the Tasiusarsuaq terrane of southern West Greenland, with the aim to provide constraints on the origin of such textures. The migmatitic mafic granulites of the Tasiusarsuaq terrane occur as enclaves in Mesoarchaean TTG gneisses, and have a peak metamorphic mineral assemblage of diopside + orthopyroxene + hornblende + plagioclase + ilmenite $\pm$ garnet $\pm$ quartz $\pm$ magnetite. Retrogression and subsolidus reworking is mainly marked by the development of coronitic garnet and garnet-quartz symplectites separating plagioclase from pyroxene, and by the replacement of pyroxene by hornblende + quartz symplectites. Pseudosection modelling in NCFMASHTO constrains the peak M1 at granulite facies conditions of ca. 850°C and 7.5 kbar, consistent with the presence of the leucosomes. The M1 metamorphism was followed by near-isobaric cooling to conditions of ca. 700°C and 7.5 kbar prior to M2 reworking. T-MH_2O pseodosections show that M2 occurred at low water activities, and that the rocks were not rehydrated subsequent to M1. Instead, the stability of garnet increases dramatically to lower P under fluid-absent conditions, allowing rocks that were garnet-free during fluid-saturated prograde-to-peak metamorphism to become garnet-bearing during near-isobaric cooling under fluid-absent conditions.