



Formation of garnet coronas during high-P retrogression in mafic granulites of the Mesoarchaean Tasiusarsuaq terrane, southern West Greenland.

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The Mesoarchaean Tasiusarsuaq terrane in southern West Greenland consists of TTG gneisses, and, locally, supracrustal rocks that were metamorphosed to medium-pressure granulite facies conditions at ca. 2.8 Ga [1]. Typical mineral assemblages in mafic granulites are clinopyroxene + orthopyroxene + plagioclase + quartz + hornblende ± garnet, and quartz + plagioclase + clinopyroxene + orthopyroxene + biotite in TTG gneisses. The peak of metamorphism has been estimated at ca. 750-800°C and 8-10 kbar [2], and was followed by locally extensive amphibolite-facies retrogression, most notably in a several km-wide zones at the northern margin of the terrane.

Locally, the mafic granulites contain coronitic garnet-quartz symplectites that separate clinopyroxene and orthopyroxene from plagioclase grains. These textures have been interpreted to indicate that the peak of metamorphism was followed by near isobaric cooling [3], but the conditions of garnet growth and their significance for the retrograde PT-evolution have not been constrained. In order to study the origin of these textures, we sampled a variety of granulites from the central and northern part of the terrane, with variable degrees of retrogression. In the least retrogressed samples, the peak assemblages are generally well preserved. Retrogression is marked by rare garnet coronas separating plagioclase from clino- and orthopyroxene, or by small poikiloblastic garnet grains with inclusions of clinopyroxene and plagioclase. With increasing retrogression, the modal amount of coronitic garnet-quartz symplectites increases, and the pyroxenes are progressively replaced by a fine-grained assemblage of hornblende and quartz. In the most retrogressed samples, orthopyroxene and clinopyroxene are only present as relict phases, and the stable mineral assemblage is garnet + hornblende + plagioclase + quartz. Garnet in the coronitic garnet-quartz symplectites forms Alm-Grs-Py solid solutions and is relatively unzoned (Alm60–70Grs15–20Py10–18). Plagioclase ranges in composition from andesine to labradorite. The cores of the grains have relatively high Ca-concentration, whereas the rims are enriched in Na.

Preliminary estimates for the peak of metamorphism, using various geothermometers and the THERMOCALC “average PT-method” [4], are ca. 800-850°C and 7-11 kbars, in agreement with previous studies. Derived PT-paths indicate that the Tasiusarsuaq terrane experienced high-P retrogression to conditions of ca. 600-700°C and 6.5 kbar ± 2 kbar, consistent with near isobaric cooling. However, the age of retrogression seems to postdate the peak of metamorphism by ca. 60-100 million years [5], and was associated with regional-scale thrusting. This suggests that the garnet coronas were not simply formed during thermal relaxation, but during terrane accretion in the Neoproterozoic.

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