Geophysical Research Abstracts
Vol. 13, EGU2011-10089, 2011
EGU General Assembly 2011

Alteration systematics and petrology of gold-bearing quartz veins on the island Qilanngaarssuit, southern West Greenland.

Martin Koppelberg (1), Annika Dziggel (1), Jochen Kolb (2), Denis Martin Schlatter (2), and Robert Flock (1)

(1) Institute of Mineralogy and Economic Geology, RWTH Aachen University, D-52056 Germany (adziggel@iml.rwth-aachen.de), (2) Department of Petrology and Economic Geology, Geological Survey of Denmark and Greenland, DK-1350 Copenhagen K, Denmark.

The North Atlantic craton of southern West Greenland represents one of the best-studied Palaeo- to Mesoarchaean cratons on Earth. Despite its considerable size and major accretionary tectonics in the Neoarchaean [1], orogenic gold deposits are extremely scarce, and, to date, only a few gold prospects have been described in the literature. Within the framework of a GEUS expedition program, aimed at investigating the orogenic gold potential of hydrothermal vein systems in the Nuuk region, a new gold occurrence was recently discovered on the island Qilanngaarssuit, some 35 km south of the capital Nuuk.

The island Qilanngaarssuit is dominated by Palaeoarchaean TTG gneisses of the Færingehavn terrane, which are overlain by a sequence of mainly amphibolites and aluminous paragneisses that originated from ca. 2840 Ma volcanic protoliths [2]. The gold-bearing quartz veins are hosted by the amphibolites in the central part of the island, and are surrounded by a ca. 8m hydrothermal alteration zone. Individual, ca. 10-20 cm wide, veins are parallel to the main foliation, and can be followed over several hundred meters along strike. The hydrothermal alteration zone contains up to 770 ppb Au [3]. Structural data indicate that the veins were formed during flexural slip folding during the regional D3 deformation.

The unaltered amphibolites in the foot- and hanging wall of the hydrothermal vein system consist of hornblende (40%), plagioclase (30%), clinopyroxene (20%), and clinozoisite (10%). Towards the veins, this assemblage is progressively replaced by a high-T mineral assemblage of garnet, quartz, plagioclase, biotite, and sillimanite. In contact to the veins, the hydrothermal alteration zone consists of up to 50% garnet (Alm56-68Prp24-30Grs2-15), 20% quartz, 15% plagioclase (XAb = 0.59-0.63), 10% biotite, and 5% sillimanite. Ore minerals are relatively rare, and include pyrrhotite, chalcopyrite and gold. The amount of alteration minerals decreases with increasing distance from the veins. Near the contact to the unaltered amphibolites, sillimanite is absent. Mass balance calculations indicate that the ore fluid was enriched in SiO2, K2O, LREE, Au, Mo, As, and Cu. In vein-dominated samples, the hydrothermal overprint was associated with an increase in volume; however, garnet- and sillimanite-bearing samples record a significant volume loss (Fv: 0.50-0.85). We interpret this to indicate leaching of elements, particularly SiO2, from the altered wall rocks. Preliminary PT estimates on the alteration assemblage indicate conditions of ca. 600°C-700°C and 5 $\pm$ 1 kbar.

The alteration systematics and conditions of the gold mineralization on Qilanngaarssuit are similar to that of other gold occurrences in the Nuuk region. The deposits are closely associated with a major terrane boundary, the Ivinnguit fault, suggesting that this shear zone acted as a major pathway for the gold-bearing fluids.

[1] Nutman, A.P., Friend, C.R.L., 2007, Adjacent terranes with ca. 2715 and 2650 Ma high-pressure metamorphic assemblages in the Nuuk region of the North Atlantic Craton, southern West Greenland: Complexities of Neoarchaen collisional orogeny: Precambrian Research, 155, p. 159-203.

[2] Friend, C.R.L., Nutman, A.P., Baadsgaard, H., Kinny, P.D., McGregor, V.R., 1996. Timing of late-Archaean terrane assembly, crustal thickening and granite emplacement in the Nuuk region, southern West Greenland. Earth and Planetary Science Letters, 142, 353-365.

[3] Kolb, J., Stensgaard, B.M., Schlatter, D.M., Dziggel, A., 2009. Controls of hydrothermal quartz vein mineralization and wall-rock alteration between Ameralik and Sermilik, southern West Greenland. Geological Survey of Denmark and Greenland, Report, 2009/25, 76pp.