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Scheelite occurrences in granulite facies metamorphosed supracrustals, West Greenland

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In 1982 the first traces of scheelite in heavy mineral concentrates from stream sediments were found in the Godthåbsfjord area. Subsequently a quite extensive scheelite mineralisation has been found in the Malene supracrustal rocks (Appel, 1986a). During 1985 a regional stream-sediment sampling programme was carried out covering an area of about 30 000 km^2 within the Godthåb area. As a result of this programme scheelite was found in most of the streams draining Malene supracrustal rocks (Appel, 1986b). One of the areas which appeared to be interesting is the Sermilik area *c.* 75 km south of Nuuk. In this area several streams with high contents of scheelite were found. The area has been subject to granulite facies metamorphism and a major granitic intrusion emplaced. Both events might have caused extensive mobilisation and subsequent upgrading of stratabound scheelite mineralisation. The supracrustals are situated at the shore of a small fjord, where ice rarely causes problems for shipping. The alpine topography, with near vertical cliffs, poses an obstacle for prospecting.

The present paper describes only field observations. Laboratory work is confined to X-ray identification of scheelite in some of the heavy mineral concentrates and in a few rock samples.

Geologic setting

The Sermilik area was mapped for GGU by P. R. A. Wells in 1976 and the results were used in compilation of the geological map of Greenland 1:100 000 Buksefjorden 63 V.1 Nord with a descriptive text by Chadwick & Coe (1983).

The main rock types in the area comprise the Nûk gneisses, the Malene supracrustals and the Ilivertalik granite (fig. 1). The Malene supracrustals, which are enclosed in the slightly younger Nûk gneisses, are approximately 3300 to 3000 m.y. old (Chadwick & Coe, 1983). The Malene supracrustals in the Sermilik area consist of banded and massive amphibolites, presumably representing mafic intrusives, lavas and tuffs. Within the amphibolites several extensive rusty horizons are seen, some of which contain well over 10% pyrrhotite and chalcopyrite. In some of the amphibolites calc-silicate bands occur. These bands, which consist mainly of diopside with minor amounts of garnet, are rarely more than one metre long and a few centimetres wide.

Extensive metasedimentary horizons are interlayered in the amphibolites. They consist mainly of quartzitic rocks with varying amounts of garnet and sillimanite. Garnet locally makes up well over 50% of metre-wide quartzitic horizons. Sillimanite is mostly rather fine grained and usually amounts to less than 5%. Locally, however, sillimanite-rich bands with *c.* 50% sillimanite occur in the quartzitic horizons.

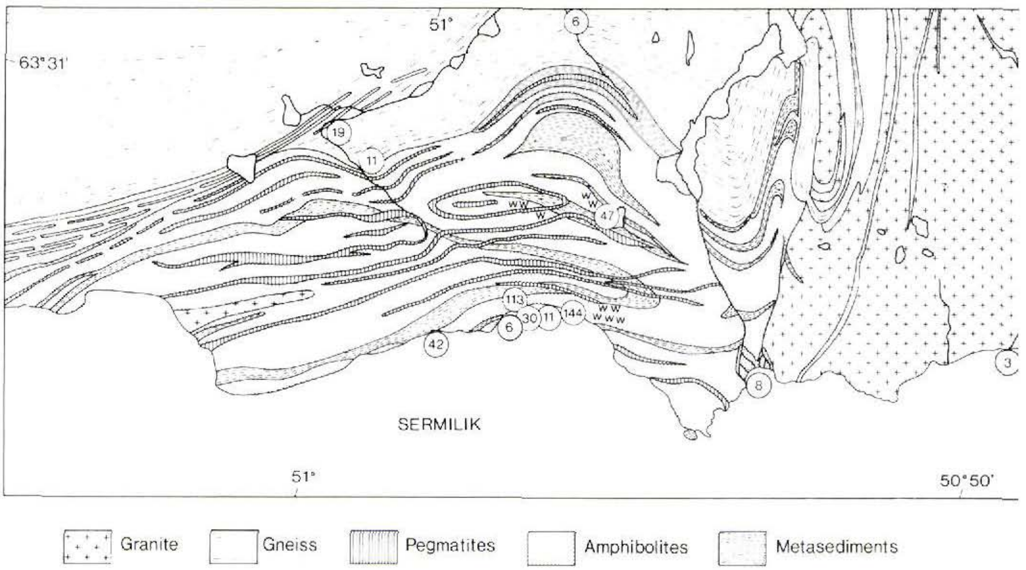
In the metasedimentary horizons several bands of pure carbonate, up to one metre wide, have been seen. These bands pinch and swell along strike, and have been traced intermittently for several hundred metres. Thin carbonate horizons often grade into greenish calc-silicate bands consisting mainly of diopside with small amounts of garnet. The same mineral assemblage is frequently seen where carbonate bands border quartzitic rocks.

In the metasediments several metre-wide, somewhat rusty, horizons are seen. They consist frequently of sillimanite-bearing quartzites with small amounts of pyrrhotite and chalcopyrite, locally with tiny flakes of molybdenite. Graphite has been found as small flakes in a few metasedimentary horizons.

The Sermilik area has been repeatedly metamorphosed and suffered several phases of deformation. The highest metamorphic grade attained in the area is granulite facies as witnessed by the abundance of hypersthene in the gneisses as well as in the supracrustal rocks. The supracrustals have been intruded by several major quartz-feldspar pegmatites, and these pegmatites have subsequently been deformed (fig. 1). After the main deformation of the supracrustals and the gneisses the area has been intruded by the Ilivertalik granite (Chadwick & Coe, 1983).

Stream sediment sampling

During the field season of 1986 follow-up stream sediment sampling was carried out using the same procedure as last year (Appel, 1986b), whereby approximately 10 litres of gravel and sand is sieved. The amount of sieved material is measured and subsequently panned, and the number of scheelite grains counted in the heavy mineral concentrate. This year, however, two 'bulk' stream sediment samples, consisting of 50 and 70 litres of gravel and sand, were collected in the streams indicated with 30 and 50 grains of scheelite, respectively (fig. 1). These samples will be analysed for gold. A total of 36 stream sediment samples have been collected and the number of scheelite grains counted in each. The number of scheelite grains in selected samples is shown in fig. 1.



The stream-sediment sampling has shown that the most important scheelite mineralisation occurs within and slightly below the large recumbent fold shown on fig. 1. The large fold is exposed in a near vertical cliff approximately 250 m high. Another very promising area occurs a little further east (fig. 1). This area is likewise very steep, thus additional stream-sediment sampling is not feasible.

Scheelite occurrences

Due to the steep topography and restricted time available, only a limited amount of work with ultra-violet light at night was carried out in the vicinity of the camp site, which was situated in the central part of the supracrustals next to the stream with 47 grains of scheelite per litre (fig. 1). Nevertheless, quite a few scheelite-bearing horizons were found.

With the exception of a few scattered grains of scheelite with yellowish fluorescence in carbonate horizons, all scheelite found so far occurs in amphibolites. The scheelite occurs here as tiny disseminated grains and as grains arranged in bands which are parallel to the banding of the host amphibolite. The scheelite-rich bands contain up to 10% scheelite, and the bands are locally up to one centimetre wide and can be traced for a few tens of metres. Scheelite has also been found as stringers, in veinlets, as joint coatings and as centimetre-sized porphyroblasts. The scheelite mostly displays a bluish fluorescence, but some of the porphyroblasts fluoresce with white and yellowish colours. The scheelite-bearing amphibolites are up to 2.5 m wide and can be traced for up to a few tens of metres along strike, but are open at both ends. Calc-silicate bands up to 50 cm long and a few centimetres wide occur frequently in the scheelite-bearing amphibolites, and these calc-silicate bands often contain scheelite. Several of the scheelite-bearing calc-silicate bands exhibit complicated fold patterns and the scheelite bands within the calc-silicate bands have clearly also been folded.

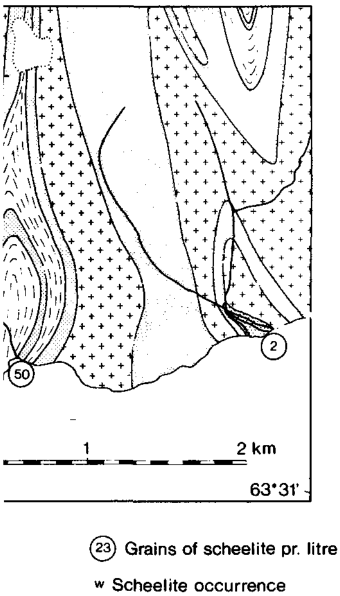


Fig. 1. Simplified geological map of the main supracrustal belt in the Sermilik area. Numbers denote number of scheelite grains per litre in heavy mineral concentrates in stream sediments.

Conclusions

The stream-sediment sampling programme has outlined two main areas in Sermilik which appear to host extensive scheelite mineralisation.

Work with ultra-violet light in the immediate vicinity of the camp site has revealed stratabound scheelite mineralisation which looks very similar to the stratabound scheelite mineralisation found in the amphibolite facies metamorphosed Malene supracrustals further north (Appel, 1986a). It is thus obvious that the stratabound scheelite occurrences disclosed so far in the Sermilik area were not greatly modified by the granulite facies metamorphism.

It is, however, premature to exclude the possibility of some mobilisation of scheelite during granulite facies metamorphism and/or during the intrusion of the Ilivertalik granite. Before this possibility can be excluded, detailed (possibly airborne) scheelite prospecting should be carried out on the steep slopes of Sermilik.

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