*Research Note*

# Kyanite in upper Proterozoic quartzite near Veslebukta, Wedel Jarlsberg Land, western Spitsbergen

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Cheng, A., Craddock, C. & Zhu, G. 1989: Kyanite in upper Proterozoic quartzite near Veslebukta, Wedel Jarlsberg Land, western Spitsbergen. *Polar Research 7*, 147–148.

Kyanite has been identified in three specimens of dolomitic quartzite collected near Veslebukta, western Spitsbergen. The host rocks are fine-grained dolomitic quartzite with a recognizable foliation. The kyanite occurs as metacrysts, probably pre- or syntectonic; none appears detrital. The non-parallel kyanite crystals define laminae, and some of these layers are isoclinally folded, with axial planes parallel to foliation. This unusual occurrence of kyanite suggests that the metamorphism associated with the Proterozoic deformation may have reached medium grade, at least locally.

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The metamorphic history of western Spitsbergen is poorly known. An early Paleozoic (Caledonian) cycle of deformation and metamorphism has long been accepted, but in recent years evidence has accumulated for a late Proterozoic event as well. Work since 1977 by University of Wisconsin geologists in western Wedel Jarlsberg Land has defined two Proterozoic sequences separated by a marked angular unconformity. The older sequence (OS) was already widely overturned at the time of deposition of the younger sequence (YS) (Bjornerud 1987). We report here evidence for possibly medium-grade metamorphism during the Proterozoic deformational event which preceded this unconformity.

During mapping of the area between Brevassbukta and Kapp Borthen in 1982, more than 70 rock specimens were collected, nearly all of them metasedimentary (Cheng 1984). Three of these specimens, collected in the area between Brevassbukta and Kokkbukta (Fig. 1), contain kyanite; the specimens are A (UW-1757-52), B (UW-1757-53) and C (UW-1757-66). These specimens all come from the OS, but their exact stratigraphic positions are not established due to poor outcrop in the area. However, the specimens are so similar that they can be described together.

The specimens consist of tan, fine-to medium-grained dolomitic quartzite, and display a finely pitted surface (probably due to weathering of carbonate grains), a recognizable foliation (micro- and macroscopically) and obscure line-

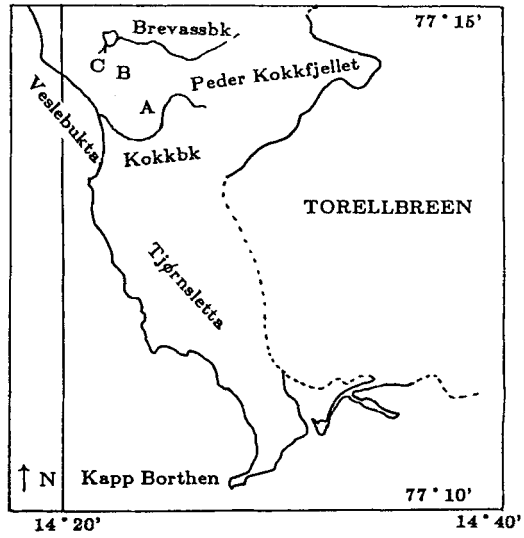


*Fig. 1.* Study area, showing locations of specimens A, B. C.

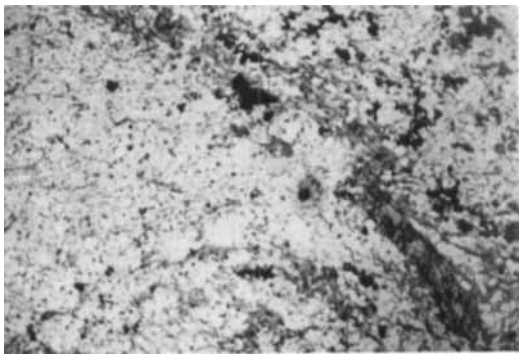

*Fig. 2.* Photomicrograph of specimen A showing kyanite grains (aligned in a diagonal lamina). Quartz and iron-stained carbonate minerals comprise up to 85% of the mode, and a few opaque grains are present. Foliation is not well-developed in this specimen. Plane polarized light, 4.0 mm × 6.0 mm.

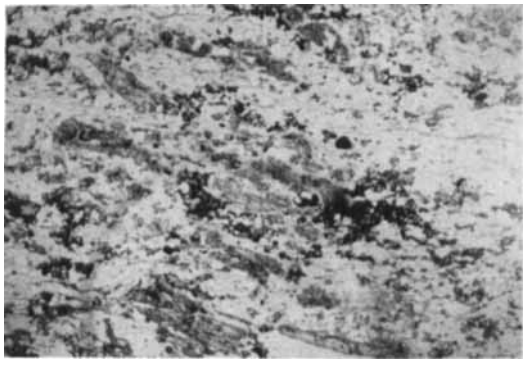

*Fig. 3.* Photomicrograph of specimen B showing isoclinally folded kyanite-bearing lamina (medium relief, gray color). The axial planes of these folds are parallel to the foliation and the spaced cleavage (not shown here, visible in hand specimen). Plane polarized light, 4.0 mm × 6.0 mm.

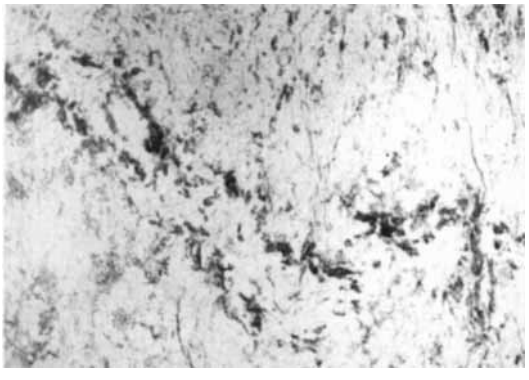

*Fig. 4.* Photomicrograph of specimen C. Kyanite-bearing laminae are tightly folded with growth or realignment along the foliation. Note apparent offset of laminae along foliation surface. Plane polarized light, 4.0 mm × 6.0 mm.

ation in the foliation. Quartz and carbonate minerals comprise 85% of the mode, but muscovite and chlorite are common and opaque grains a trace (Fig. 2). The quartz grains are interlocked, but where mica and carbonate grains are abundant they may appear subrounded.

The kyanite grains are prismatic, equant, or irregular in shape. Both the fragile shapes of the individual grains and their varied texture show that they are metacrysts. These aluminium silicate ($Al_2SiO_5$, confirmed by microprobing) grains are identified as kyanite on the basis of their optical properties (e.g. non-orthorhombic). In places these kyanite laminae (probably original bedding) are tightly to isoclinally folded, with the axial planes parallel to the foliation (Fig. 3). Alignment of individual grains along the foliation and offset of laminae and grains (Fig. 4) suggest deformation of these metacrysts.

Tight to isoclinal folds in quartzite are characteristic of the OS, but in the closest YS the beds are only tilted. Therefore, the folds in these quartzite specimens are attributed to the Proterozoic deformational event rather than the Caledonian event. Because some of the kyanite grains seem to be disturbed by the folding, the peak of metamorphism probably pre-dated the peak of this Proterozoic deformation.

The exact stability field of kyanite is not established, but it can form in the upper temperature range of low-grade metamorphism if the pressure is great enough (Winkler 1979). It is, however, much more common at the higher grades of metamorphism. Its presence in these rocks suggests that the Proterozoic metamorphic event may have reached medium grade, at least locally.

## References

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