

CONTRIBUTIONS TO THE MINERALOGY  
OF NORWAY

## No. 30. Minerals from Nordmarkite Druses

BY

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**Abstract.** Crystals of phenacite, milarite, bertrandite, ancylite, wulfenite, pyrosmalite, and harmotome occur in nordmarkite druses in the Grorud district. The Grorud milarite contains substantial amounts of yttrium and yttrium earths. Milarite and pyrosmalite are new species for Norway.

It is well known that the boundary zone of the nordmarkite in the Grorud district, near Oslo, is rich in druses and that several rarer minerals have been found in them, e.g. sphene, zircon, allanite, helvine.

Recently, additional species have been found in a quarry at Flaen in eastern Grorud. The nordmarkite here is dissected by aplitic veins and unusually rich in druses and open fissures containing a fair amount of rare minerals, some of them previously mentioned (OFTE DAL and SÆBÖ 1963). We intend to examine more closely some of the minerals mentioned below. The principal purpose of the present note is to announce new finds.

*Phenacite* is a new species in the Permian rocks of the Oslo Region. It occurs sparsely as transparent and colourless crystals, mostly smaller than 1 mm. By careful inspection of a number of druses we now have 12 crystals altogether, all but one grown on faces of orthoclase, the one sits on a quartz rhombohedron face. The phenacite crystals are partly enclosed by orthoclase. We did not try to loosen them and thus actual measurements of face angles were not carried out. However, it can be seen that they are bounded by a vertically striated prism zone, which is usually very short, and a predominant rather flat rhombohedron, probably  $\{10\bar{1}1\}$ , which is strongly etched (Fig. 1). Otherwise the mineral was identified by optical, X-ray, and spectrochemical

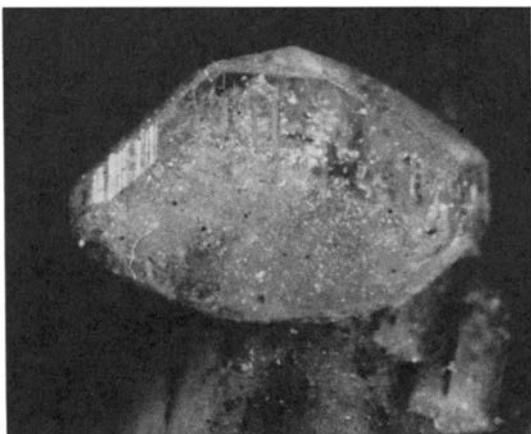


Fig. 1. Phenacite crystal. c-axis vertical. Size about 3 mm.

examination. It contains small amounts of boron (cf. OFTEDAL 1964). So far phenacite has been found in a very limited part of the quarry, but due to the small and inconspicuous crystals it may be more widely distributed. Associated with phenacite are (in addition to feldspars, quartz, etc.) fluorite, allanite, and milarite.

*Milarite.* This is a new species for Norway. It was identified by optical, X-ray, and spectrochemical methods. In addition, the characteristic crystal habit is easily recognized. It is a rare mineral but fairly evenly distributed in the druses. It has grown directly on the surfaces of quartz and orthoclase and appears to be a late formation. The largest crystal at our disposal is a (pseudo-)hexagonal prism with base 3 mm long and 1 mm thick. The faces are generally perfect (Fig. 2). Very small crystals are colourless, the larger greenish. There is also a notable difference in optical properties: the refractive indices are about 1.555 and 1.540 for colourless and greenish milarite respectively, and also the birefringences appear to differ, about 0.003 and 0.002 respectively. Both of the above refractive index values are appreciably higher than those given for the original milarite (Val Giuf, Switzerland, about 1.530). However, just like the Val Giuf milarite, the Grorud mineral often shows the apparent hexagonal prism divided into six optically biaxial sections with small axial angles, the planes of the optic axes being parallel to the 'prism' faces. Optical spectrograms of the Grorud milarite show—in addition to the constituents required by the current formula—Y and Yb as major constituents.

Fig. 2. Cluster of milarite crystals about 1 mm long.



This may explain the relatively high refractive indices. Sc is a notable minor constituent. Spectrograms of the Val Giuf milarite likewise show the presence of Y and Yb, but in much smaller amounts. A milarite specimen from Czechoslovakia barely shows traces of these elements.

*Bertrandite.* This is one of the rarest minerals in the druses. It was identified by its optical properties and its X-ray pattern. The crystals are nearly always smaller than 1 mm and mostly twinned. In two cases it was observed that the twin consisted of two thin tables forming an angle of about  $60^\circ$  with each other ('V-twins'). The crystals are colourless or greenish transparent and often exhibit good faces. Among the minerals associated with bertrandite are fluorite, haematite, zircon, and pyrochlore(?). Bertrandite is a new species for the Oslo region.

*Ancylite.* Minute crystals (about 0.1 mm) resembling octahedra occur rather frequently, but the total quantity is very small. The majority of the crystals are of a dull yellow colour and are really pseudomorphs consisting of extremely fine-grained bastnaesite (identified by X-ray photographs), just like the so-called weibyeite from the Langesundsford (SÆBÖ 1963). Unaltered ancylite is extremely rare in the druses. It is yellowish transparent. The X-ray pattern corresponds exactly with that of ancylite from Greenland, but the refractive indices are somewhat higher:  $\beta = 1.720$  (as compared with 1.700). The birefringence is very strong;  $2V(-)$  is about  $70^\circ$ . Ancylite appears to be one of the latest minerals in the druses.

*Wulfenite* is a very rare mineral at Flaen, but appears to be a characteristic species of the nordmarkite druses as it has also been found at Bånkall, several hundred metres to the northeast. The crystals are only about 0.2 mm long and exhibit a prism zone with fairly steep pyramids at both ends. The colour is brown with a strong waxy luster. The identity was established by optical, X-ray, and spectrochemical examination. The spectrogram shows, apart from some common 'impurities', only the major constituents Pb and Mo. In particular we point out that no W was detected. A mineral from Foss in Sigdal, classified as stolzite (NEUMANN 1959), and the wulfenite from Grorud give identical X-ray patterns. We have not yet examined the Sigdal mineral spectrochemically. The wulfenite occurs in small crystal clusters which sometimes grow directly on crystals of galena. It may be associated with milarite and bertrandite.

*Pyrosmalite* is a new species for Norway. It was found in a specimen taken some 15 metres distant from the spot where the above beryllium minerals occur. It forms yellowish-green hemispheres 1 mm in diameter consisting of radiating crystals and grows on faces of orthoclase, albite, quartz, and hornblende. The X-ray pattern agrees with that of pyrosmalite, and the optical spectrogram shows the major constituents required by the current formula. The content of Cl has been verified by Mr. Sverre Teigen. Optically the mineral is uniaxial negative with  $\omega = 1.672$ . Among the associated minerals is *harmotome* (major constituents checked spectrochemically) in cruciform twins up to 4 mm in size.

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