CONTRIBUTIONS TO THE MINERALOGY OF NORWAY

No. 3. Bavenite from Boksjøen mineral mine, near Aspedammen in the county of Østfold.

By

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In 1952 Dr. O. J. Adamson visited the Boksjøen mineral mine in search of beryl and found on that occassion rosettes of a fibrous mineral which he could not find time to examine himself, and therefore passed over to the Geological Museum for identification. Dr. Adamson and the senior author revisited the place in June 1953 to collect additional material for further investigations of the then unknown mineral, which was later identified as bavenite.

The Boksjøen mineral mine (Boksjøen mineralgrube), which actually is a small quarry, is situated about 1 km SSE of the farm Toklund and about 200 m from the shore of the lake Nordre Boksjø in the parish of Idd in the county of Østfold, see key map fig. 1. In the pegmatite dyke which is 5—10 m wide striking between NE and NNE and dipping about 35° E, the following minerals have been found: quartz, alkali feldspar, plagioclase, mica, garnet, beryl, and bavenite. The dyke has been worked for feldspar, yielding some beryl as a by product.

The bavenite is found as radiating flat sheafs of lathshaped, grey crystals on the surface of or in cracks in beryl. The irregular sheafs may attain a size of 2—3 cm in diameter but are usually somewhat smaller. Muscovite (structure variety 2 M_1) is the only mineral found together with and occurring in the same way as bavenite, and is obviously paragenetical with it. Muscovite is older than bavenite.

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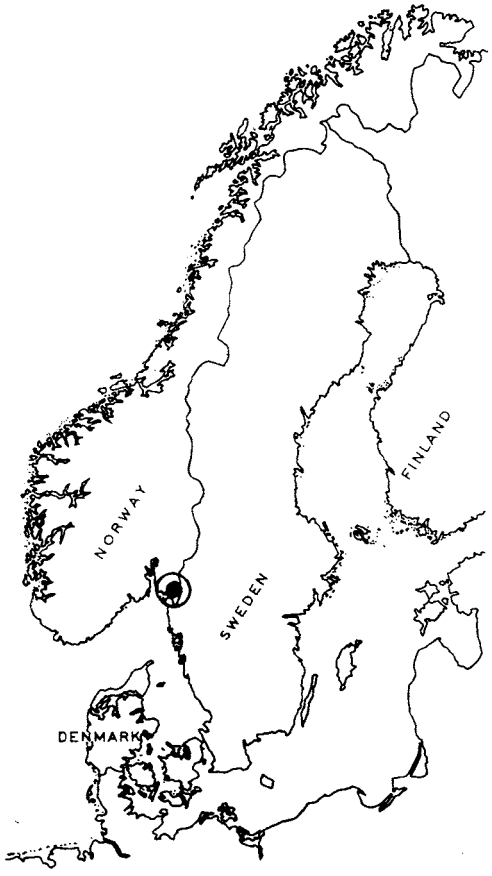

Fig. 1. Key map. The dot with a ring around it indicates the location of Boksjøen mineral mine.

The optical properties are: $2V_{+} = 47° \pm 3°$, $\alpha = 1.580$, $\beta = 1.584$, $\gamma = 1.590$ (Average values of data published earlier for bavenites from other localities (6) : $\alpha = 1.581$ (1.578 — 1.586), $\beta = 1.583$ (1.579 — 1.588), $\gamma = 1.589$ (1.583 — 1.593)). An X-ray powder pattern taken with Mn-filtered Fe-radiation on a 9 cm camera is in every detail identical to the patterns of bavenite from Baveno, Italy and of bavenite (duplexite) from Londonderry, Australia. A picture of the bavenite pattern and X-ray powder data are published earlier by M. FLEISCHER and G. SWITZER (6).

Finds of bavenite have been recorded earlier:

1) From the Baveno granite, Italy, on feldspar crystals in pegmatitic druses together with younger mica, epidote, and laumontite. (1).

2) From Himalaya mine, Mesa Grande, San Diego Co., California in pegmatite as a pseudomorph after beryl, and also as fibrous spherules in cavities in relics of the original beryl crystal. (2).

3) From below the Muotta Nera, Piz del Laiblau, Val Nalps, Tavetschthal, Graubünden, and on the slopes of the east side of Val Casaccia, Val Cristallina, Graubünden in Switzerland, from alpine veins as radiating aggregates of platy fibres. (3).

4) From the Izumrudnaja emerald mines in the Malischevski district in Russia, on the dumps from the Kirov shaft, in the Skutinai shaft, and in shaft no. 5, partly together with microcline (with a con-

tent of 1.2 % BeO) replacing beryl or even as pseudomorphs after beryl, partly in small crosscutting veins either in the paragenesis: plagioclase, fluorite, apatite, corundophilite, muscovite, ripidolite, and alkali-feldspar (with .58 — 1.2 % BeO) or in the paragenesis: plagioclase, epidote, sphene, and prochlorite. Bavenite is a very young mineral in the parageneses, the only younger mineral is ripidolite which is found as small spherulites on the surface of crystal aggregates of bavenite. In the zone of weathering bavenite is unstable and is in turn replaced by bertrandite and some other unidentified minerals.

E. KUTUKOVA (4) has described this occurrence of bavenite and discussed its genesis at some length. He reached the conclusion that it was formed by reaction of plagioclase and beryl with late hydrothermal solutions. A minor part of the beryllium going into solution by this reaction was fixed again in situ by the formation of bavenite and microcline with a content of 1.2 % BeO, while the major part of it was removed and redeposited elsewhere as bavenite in small crosscutting veins together with the minerals mentioned above.

5) From Londonderry feldspar quarry near Coolgardie, Western Australia, in a pegmatite. Bavenite is "one of the last (minerals) to crystallize from the mineralising solution penetrating the pegmatite and ..... has crystallized at the same time as or later than the idiomorphic quartz crystals". It is older, though, than bityite which occurs together with it and is probably genetically closely related to it. (5).

6) From Rutherford mine, Amelia, Virginia, in a pegmatite as rosettes of thin platy crystals from a cavity in cleavelandite. A few minute crystals of younger bertrandite are emplanted on the bavenite. (6).

In the Boksjøen occurrence bavenite is found as the very youngest mineral. It is highly improbable that the fairly large crystals of bavenite and of muscovite were formed by weathering even if this cannot be disproved beyond doubt with the material at the authors' disposal and with the present shallow exposure of the pegmatite dyke. In harmony with data cited above from the other known bavenite occurrences the authors feel confident in stating that the Boksjøen bavenite is a deuteric mineral formed by the reaction of a late pegmatitic hydrothermal solution with beryl which apparently during that late stage of the pegmatite formation became unstable under the prevailing

PTX conditions. The necessary amounts of Ca and K to form bavenite and muscovite seem to have been supplied by the hydrothermal solution at play as we have no indication of a contemporaneous reaction of plagioclase to supply Ca as suggested by Kutukova in the case of the Izumrudnaja bavenite. The balance of Al and Si is hard to calculate without further data on the relative amounts of paragenetical bavenite and muscovite and without an exact knowledge of the formula of bavenite.

Acknowledgement

Thanks are due to Mrs. Natascha Heintz for translating Kutukovas paper (4).

Added in proof: The mineral pilinite from Striegau, Silesia (A. v. Lasaulx. Jb. Min. 1876, p. 358) has recently been found to be identical with bavenite. (Brian Mason, 1959, personal communication).

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