

# Barite and celestite in central East Greenland

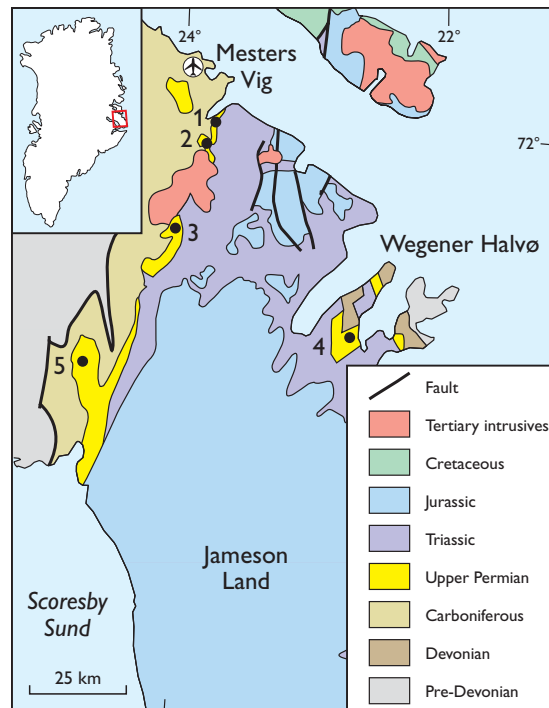
Significant concentrations of stratabound barite and celestite are hosted by the Upper Permian carbonate sequences of central East Greenland. During exploration by Nordisk Mineselskab A/S 1952–84, these minerals were used as pathfinders for base metal mineralisation. The low market price for sulphates of barium and strontium was the reason why they never constituted economic targets in their own right.

## Geological setting

Following denudation of the Caledonian fold belt, epicontinental rift basins developed along the east coast of Greenland in which Upper Permian shallow marine sediments were deposited. The stratabound barite and celestite occur in the Jameson Land Basin that covers approx. 13,000 km<sup>2</sup>. The Upper Permian Foldvik Creek Group rests with angular unconformity on Devonian to Lower Permian continental clastic sediments being overlain conformably by Triassic to Cretaceous, mainly marine clastic sediments. Tertiary igneous rocks intrude this succession. The c. 300 m thick Upper Permian sequence comprises a basal conglomerate, marginal marine evaporites and carbonates (Karstryggen and Wegener Halvø Formations), bituminous shale and a shallow marine clastic unit. Stratabound copper-lead-zinc mineralisation is common in the Upper Permian and Triassic sediments.

## Barite

The most significant barite occurrences are in the western part of the Jameson Land Basin in a specific strata level at the base of the Karstryggen Formation. They are invariably associated with steep 160°–180°-trending faults hosting sulphide-bearing quartz-barite veins. The stratabound barite is typically developed as 'zebra' barite, i.e. a rhythmically banded deposit consisting of mm-cm thick, alternating white and grey bands that resembles bedding, even cross-bedding. The white bands are pure barite; the grey bands are a mixture of barite and fine-grained dolomite and calcite. Varying amounts of quartz and lead-zinc sulphides accompany the barite. The massive 'zebra' barite typically contains 80–90% barite. The 'zebra' barite is considered to be formed by selective replacement of a porous limestone/evaporate unit. The zones of replacement form 2–10 m thick and 150–200 m wide belts along the 160°–180°-trending faults, which probably acted as feeders. As the feeder veins have not been observed in rocks younger than Upper Permian, a late Permian age is assumed for both the veins and the stratabound mineralisation.



Geological map of the Jameson Land Basin showing main localities for barite (1–4) and celestite (5). 1. Triaskæden, 2. Oksedal, 3. Bredehorn, 4. Devondal, 5. Karstryggen.

## Bredehorn

At Bredehorn, stratabound barite-lead-zinc mineralisation occurs within a c. 1 km<sup>2</sup> fault-bounded area that also hosts galena-sphalerite-bearing quartz-barite veins. The area has a profuse talus cover and the mineralisation is only well exposed in a steep cliff, Zebra Klint, where an 8–10 m thick 'zebra' barite unit is exposed over 300 m. This is massive in the middle part with transition zones of limestone/barite beds in the upper and lower parts. The barite beds display apparent sedimentary structures and they host silicified parts, as well as 2–4% galena and sphalerite as disseminations and massive lenses. A N–S-striking barite-quartz vein exposed in the cliff farther north is believed to represent a feeder. A resource of 300,000 tons with 72% barite has been estimated by chip sampling near the cliff, but the area is believed to host in total several million tons of barite, as well as considerable lead-zinc tonnage.

## Oksedal

Along a NNW-striking quartz-barite vein in Oksedal, the lower 5–9 m of the poorly exposed Upper Permian limestone is replaced by 'zebra' barite up to 150 m from the vein. Lead and zinc contents are negligible. A resource of



'Zebra' barite at Zebra Klint, Bredehorn.

some 330,000 tons with 90–95% barite has been indicated in a shallow sub-surface by a few drill holes.

### Triaskæden

At Triaskæden, Upper Permian limestones are baritised and silicified adjacent to a N–S-striking quartz-barite vein. A more than 3 m thick sequence of barite-bearing rocks can be followed laterally for c. 200 m on a scree slope. The barite-bearing rocks are mainly 'zebra' barite and limestones with randomly orientated barite crystals and minor disseminated galena.

### Devondal

On Wegener Halvø in the eastern part of the Jameson Land Basin, the Foldvik Creek Group is dominated by a c. 250 m thick carbonate sequence. Scattered barite veins occur in the top of the Wegener Halvø Formation throughout the peninsula but the largest concentrations exist on the north side of Devondal. Here a mainly concordant, c. 4 m thick quartz-barite-sulphide unit occurs over c. 1 km<sup>2</sup> in the contact between reefy limestone and bedded sandy limestone. This unit contains an estimated 55% quartz, 40% barite and 2–4% sulphides.

### Celestite

Celestite mineralisation occurs in the Karstryggen Formation over 80 km<sup>2</sup> of the Karstryggen plateau. It appears both in a lower 3–10 m thick algal-laminated limestone-evaporite unit where up to 80% of the calcite and gypsum can be replaced by celestite, and in an overlying c. 50 m thick karst breccia sequence. This occurs typically as large-scale veining superimposed on an intense small-scale veining and breccia filling. It is assumed that the celestite was formed by early diagenetic replacement of gypsum in the algal-laminated limestone during interaction with Sr-enriched terrestrial ground water.



Celestite crystals at Karstryggen.

Based on scattered chip sampled sections, a resource of 25–50 million tons with c. 50% celestite has been estimated for a 4 km<sup>2</sup> area. The total resources at Karstryggen are much larger.

### Concluding remarks

Due to low prices and often inaccessible locations, the barite and celestite occurrences seem to be of no immediate economic interest. Among the barite showings, Oksedal is the most attractive because of its accessibility from the coast, a gentle topography and the near absence of quartz and sulphides. It could be a useful source for drilling mud during local drilling after other commodities. The very large celestite occurrences belong to the future.

### Key references

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