The Malmbjerg porphyry molybdenum deposit, East Greenland

Malmbjerg is a 1750 m. high mountain located between two glaciers in a remote area at 72° N lat. on the east coast of Greenland. It hosts a rift-related porphyry-molybdenum deposit of the 'Climax type', discovered in 1954 during systematic mapping of the Werner Bjerge complex by members of the Danish East Greenland Expeditions. The deposit enters a new epoch, spurred by a dramatic rise in the molybdenum price.

Malmbjerg, seen from the south, between Schuchert Gletscher (left) and Arcturus Gletscher (right).

Exploration history

Investigations in 1955 – 61 by the Danish mining company Nordisk Mineselskab A/S, and in 1962 by a Nordisk Mineselskab-AMAX Inc. joint venture, included excavation of three adits totalling 1329 m, from where 146 holes were drilled some 22,000 m. Hereby an ore body of 119 Mt grading 0.25% MoS_2 at a cut-off of 0.17% MoS_2 was outlined. However, with a price at that time of US$ 1.6/lb MoO_3, mining was not economically feasible. In 1979, a new Nordisk Mineselskab/AMAX joint venture made a 972 m drill hole to test for a deep ore body. The result was negative. AMAX withdrew from East Greenland, and the property remained with Nordisk Mineselskab until its liquidation in 1991. Galahad Gold Plc acquired the property in 2004.

Geology and mineralisation

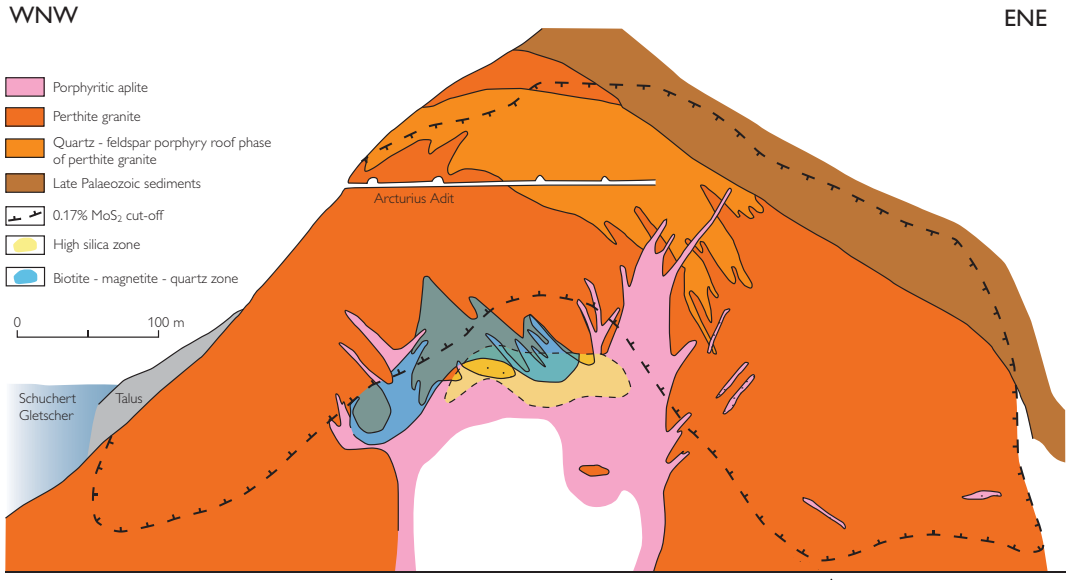
The Malmbjerg porphyry molybdenum deposit is associated with a 25.7 Ma composite alkali granite stock intruded in Carboniferous sandstones. It is part of the intrusive Werner Bjerge alkaline complex belonging to the Palaeogene East Greenland magmatic province. The granite stock consists of three lithological units: Perthite granite with a quartz-feldspar porphyry roof phase, a heterogeneous porphyritic aplite, and porphyritic granites.

Molybdenite mineralisation occurs in a 700 x 700 x 150 m inverted bowel-shaped body mainly located in the perthite granite and its porphyritic roof phase. Molybdenite occurs in veinlets ranging in thickness from hairline up to about 5 cm. The veinlets form a stock-work of mutually offsetting veins. Pyrite occurs only as an accessory mineral with an overall content of less than one per cent. Furthermore, Mo-W-bearing greisen mineralisation occurs as flat-lying up to one metre thick veins in both the granite stock and in the surrounding contact-metamorphosed sediments, and minor base metal veins occur distally. Pronounced alteration is associated with the mineralisation, both inside, below and above the stock-work molybdenum accumulation.

New operators enter the scene

International Molybdenum Plc (InterMoly), who owns 100% of the Malmbjerg project, was established in late 2004 by Galahad Gold for the purpose of developing two primary molybdenum licences in Greenland. InterMoly subsequently engaged specialist consultants, who appraised the results of the previous exploration programmes at Malmbjerg and recommended further work. They estimated that with a limited number of confirmation drill holes, their resource estimates could be upgraded to measured and indicated status, and they designed a development programme at Malmbjerg for 2005 to generate sufficient additional data to complete a bankable feasibility study by early 2006.

All field activities for the project were completed over the period April to September 2005. The programme included 4,900 m underground confirmation drilling (31 holes) and 1,776 m channel sampling along the existing adits. The drill campaign confirmed the results of previous drilling and filled in areas that were not included in previous drill campaigns.



Vertical section through the Malmbjerg ore body. After Harpøth et al. 1986.

New resource estimate

A new mineral resource estimate for Malmbjerg was announced by InterMoly on 17 November 2005:

- Measured and indicated resources of 217 Mt at a grade of 0.20 % MoS_2 with an additional inferred resource of 12 Mt at a grade of 0.15 % MoS_2, using a 0.12 % cut-off grade.
- Higher grade measured and indicated resources of 33.8 Mt at a grade of 0.28 % MoS_2, above a cut-off grade of 0.25 %.

This resource estimate, which has been prepared by Roscoe Postle Associates Inc. compliant to Canadian National Instrument 43-101, incorporates historical data as well as new data from the 2005 programme.

Plans for mining

Under its proposed base-case plan, InterMoly envisages a 15,000 t/d underground operation, producing around 14,600 t of MoS_2 concentrate with an average grade of 50 % Mo annually for 15-20 years. The mining method is expected to be large-scale underground block or panel caving, or open stoping, and ore will be crushed underground. The main mine portal will be located below the mineralised body, and the company will need to construct a 10 km underground access tunnel to convey the crushed ore from the glacier-bound deposit to the proposed plant site. A conventional process plant based on grinding, flotation and dewatering unit operations is proposed. On exiting the plant, MoS_2 concentrate will be trucked to a proposed port facility on the banks of the nearby Mesters Vig fjord.

Closing remarks

The projected capital costs for the 15,000 t/d Malmbjerg project are estimated to be in the order of US$ 605 mill. Operating costs are estimated at US$ 15.7/t ore milled, and the company calculates that the project breaks even at a MoO_3 price of US$8/lb. InterMoly expects the higher-grade zone to form the basis for initial mining of the deposit, and the company estimates a long-term price projection for MoO_3 of US$ 10-15/lb, compared with the current market price of around US$ 30/lb. The projected annual output represents around 4 % of total world consumption of molybdenum.

Splitting drill cores in InterMoly's camp, 2005

Key references

Bearth, P. 1959: On the alkali massif of the Werner Bjerge in East Greenland. Meddelelser om Grønland **153**, 4, 62 pp.

Harpøt, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central East Greenland. Meddelelser om Grønland Geoscience **17**, 138 pp.

Mining Journal (ed) 2005: InterMoly progresses Malmbjerg study, Mining Journal, September 2, p 8 only.

Bureau of Minerals and Petroleum (BMP)
Government of Greenland
P.O. Box 930
DK-3900 Nuuk
Greenland

Tel: (+299) 34 68 00
Fax.: (+299) 32 43 02
E-mail: bmp@gh.gl
Internet: www.bmp.gl

GEUS

Geological Survey of Denmark and Greenland (GEUS)
Øster Voldgade 10
DK-1350 Copenhagen K
Denmark

Tel: (+45) 38 14 20 00
Fax.: (+45) 38 14 20 50
E-mail: geus@geus.dk
Internet: www.geus.dk

Author:
B. Thomassen
Editor: K.Secher
Layout: GEUS, Grafisk

ISSN: 1602-8171