Melonite ($NiTe_2$) from the Middavarre Copper Deposit

GEIR STEINAR STRAND

Strand, G. S.: Melonite ($NiTe_2$) from the Middavarre Copper Deposit. Contribution to the mineralogy of Norway, No. 61. *Norsk Geologisk Tidsskrift,* Vol. 55, pp. 299–302. Oslo 1975.

Melonite is reported for the first time in Norway from two old prospects showing copper mineralization at Middavarre, Burfjorden, northern Norway. The mineralization occurs as steeply dipping parallel quartz-calcite veins in greenstone of Precambrian age. The mineral paragenesis in which melonite occurs is chalcopyrite, pyrite and, in accessory quantities, violarite, pentlandite, magnetite, sphalerite and millerite. Results of microprobe analysis and reflectance measurements for melonite are given and it is shown that Middavarre melonite is stoichiometric with the formula $NiTe_2$.

G. S. Strand, Geologisk institutt, Universitetet i Trondheim, Norges Tekniske Høgskole, 7034 Trondheim NTH, Norway.

Melonite was first discovered by F. A. Genth (1868) from the Melones Mine, California. He ascribed to the mineral the formula Ni_2Te_3. X-ray analysis by Peacock & Thompson (1946), however, established the formula $NiTe_2$. Later, Ramdohr (1969), taking into account the variability of composition of melonite, regarded it as a member of the NiTe–$NiTe_2$ isomorphic series.

Melonite is usually found associated with other tellurides in quartz veins. Famous deposits are the Californian quartz veins, Cripple Creek Colorado and Kalgoorlie Western Australia. It is also found in nickel–copper deposits; well-known occurrences of this type are the nickel-bearing high temperature copper deposits of Namaqualand, S. Africa. It is found in negligible amounts in copper–nickel deposits of the Sudbury type.

Melonite is a new mineral for Norway. The present author has found the mineral in specimens from two old prospects showing copper-mineralization at Middavarre, Burfjorden, north Norway. The location is shown in Fig. 1. The specimens were collected during summer 1972.

The Middavarre locality

The mineralization on Middavarre occurs as steeply dipping parallel quartz–calcite veins along a zone two kilometers long and up to 300 meters wide in greenstone belonging to the Precambrian Raipas group (Holtedahl 1969). The widths of the majority of these veins are well under one meter and the mineralization is very uneven, varying from compact ore to weak impregnation in the vein material. The main minerals, apart from the gangue minerals quartz and calcite, are pyrite, chalcopyrite and magnetite. Under the microscope the following additional minerals were observed in accessory quantities; millerite, pentlandite, minerals of the linnaeite series, sphalerite, melonite and gold.

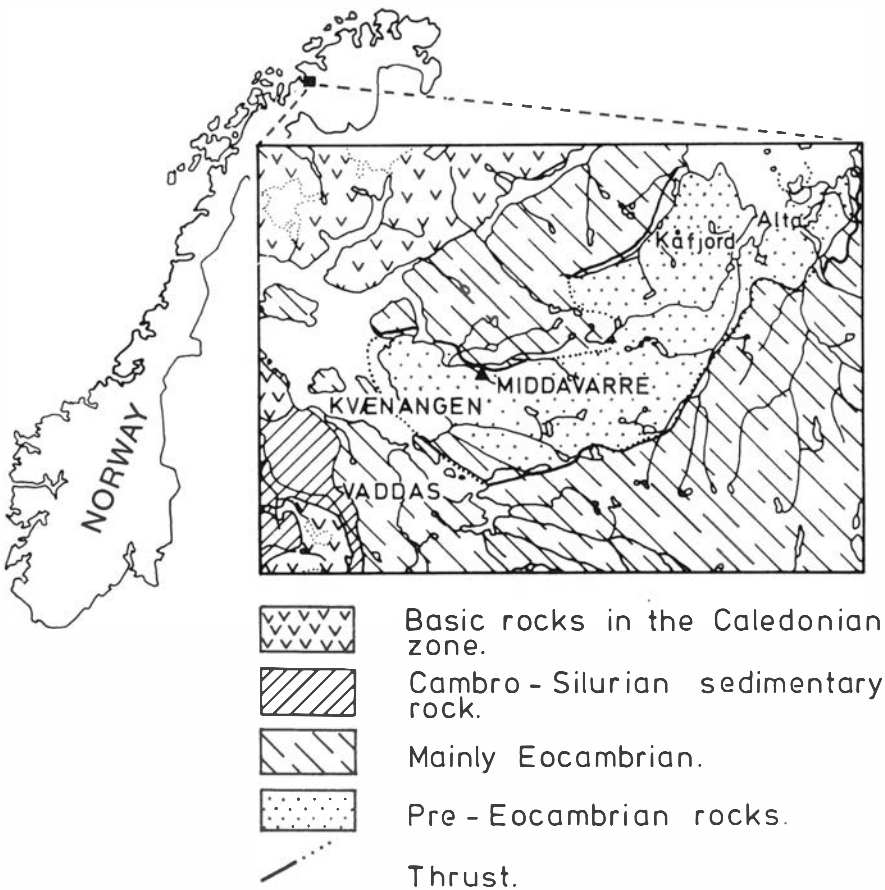

Fig. 1. From the geological map of Norway compiled by O. Holtedahl and J. A. Dons.

Mode of occurrence

Melonite has only been observed in specimens from one of the veins at Middavarre. Chalcopyrite is the most abundant mineral in these specimens, while pyrite is an important constituent. Under the microscope pyrite occurs as xenomorphic and hypidiomorphic porphyroblasts in a groundmass of chalcopyrite and often shows poikilitic inclusions of other minerals.

Melonite usually occurs as dispersed minute grains (size usually less than 0.01 mm) within the chalcopyrite. A few bigger grains, slightly elongated or with irregular forms and with sizes up to 0.1 mm, are observed either partly enclosed by pyrite or in close contact with pyrite (Fig. 2).

Other accessory minerals occurring in the specimens containing melonite are: magnetite, sphalerite, millerite, violarite and pentlandite.

Analysis

Analyses of three melonite grains were carried out on the ARL–EMX electron microprobe at the Fysisk institutt, Universitetet i Trondheim, NTH,

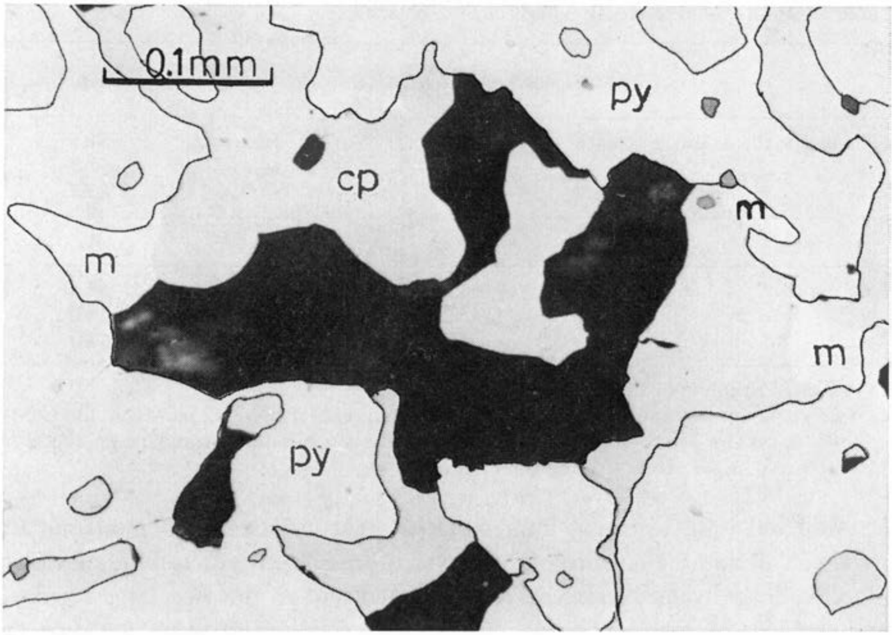

Fig. 2. Ore from Middavarre showing melonite (white, m) in close contact with pyrite (light grey, py). Chalcopyrite (darker grey, cp) and gangue minerals (dark) fill in between the subhedral pyrite grains. Plane polarised reflected light, air, 240×.

Trondheim. The analyses together with the atomic proportions are given in Table 1.

The results correspond to the formula $NiTe_2$.

The grains show very little variations, and were found to contain no elements other than Ni and Te.

Optical properties

The melonite grains usually seem to take a good polish and the polishing hardness is clearly higher than that of chalcopyrite. Cleavage or twinning lamellae were not observed.

The color is white with a very faint pinkish tint. A weak bireflectance can

Table 1. Electron-microprobe point analysis* of melonite.

	Grain 1		Grain 2		Grain 3	
	Concen-tration	Atomic proportion	Concen-tration	Atomic proportion	Concen-tration	Atomic proportion
Ni	18.89	1.016	18.61	1.000	18.65	1.006
Te	80.78	2.000	80.91	2.000	80.56	2.000

* Correction for atomic number factor, absorption and fluorescence were calculated from a correction program mainly based on that of Springer (1967), modified for a UNIVAC computer by T. Slind.

Table 2. Results of reflectivity measurements on melonite 1.2.

	Wave length	Rg	Rp
Uytenbogaardt & Burke	470 nm	56.3	54.5
	546 "	60.6	57.0
	589 "	64.0	60.4
		R_2	R_1
This paper	434 nm	56.0	53.5
	542 "	58.6	54.0
	587 "	60.5	56.0

1) A Leitz-Ortholuxpol microscope and a Leitz MPV photometer were used.
2) Two standards were used: an NPL calibrated SIC standard No. 82 issued by the Commission on Ore Microscopy and a WC standard – a preliminary standard by courtesy of Dr. N. M. W. Henry, Cambridge.

be observed only by using immersion oil. The anisotropy is moderate to strong in oil and the anisotropy color varies from light grey to blue or violet blue. Reflectivity measurements were carried out on the two largest grains and the measurements corrected for secondary glare by using the type of curves shown by Galopin & Henry (1972: 172).

Table 2 shows the results together with reflectivity measurements data from W. Uytenbogaardt & E. A. J. Burke (1971).

The data of Uytenbogaardt & Burke are for other wavelengths than those used in this paper. In two cases the differences in wavelengths are small, however, and it can be concluded that the reflectivity measurements data presented in this paper clearly differ from those of Uytenbogaardt & Burke.

Because of the small dimensions of the melonite grains, measurements of Vickers microindentation hardness have not been carried out.

Acknowledgements. – I am indebted to Professor F. M. Vokes for critically reading the manuscript, and for correcting the English.

January 1975

REFERENCES

Galopin, R. & Henry, N. F. M. 1972: *Microscopic Study of Opaque Minerals.* Hefner & Sons Ltd., Cambridge, 322 pp.

Gent, F. A. 1868: Contribution to mineralogy. *Am. J. Sci. 45,* 305–321.

Holtedahl, O. (ed.) 1960: Geology of Norway, *Nor. Geol. Unders. 208,* 70.

Peacock, M. A. & Thompson, R. M. 1946: Melonite from Quebec and crystal structure of $NiTe_2$. *Studies Univ. Toronto Ser. Geol. No. 50,* 63–73.

Ramdohr, P. 1969: *The Ore Minerals and their Intergrowths.* Pergamon Press, Oxford, pp. 419–420.

Springer, G. 1967: Die Berechnung von Korrekturen für die quantitative Elektronenstrahl–Microanalyse. *Fortschr. Mineral. 45,* 103–124.

Uytenbogaardt, W. & Burke, E. A. J. 1971; *Tables for Microscope Identification of Ore Elements.* 2nd Rev. Ed., Elsevier, Amsterdam. 430 pp.

Vlasov, K. A. 1966: *Geochemistry and Mineralogy of Rare Elements and Genetic Types of their Deposits, Mineralogy of Rare Elements.* Vol. II, Israel Program for Scientific Translations, Jerusalem, pp. 690–693.