ELECTRON MICROPROBE ANALYSES OF HEAZLEWOODITE AND MILLERITE FROM THE KEFDAĞ (GULEMAN-ELAZIĞ") CHROMITE, MINE

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ABSTRACT. — Electron microprobe analysis has confirmed the presence of heazlewoodite (mineral-A) and millerite (mineral-B); a result which is in agreement with previous work done on the samples under reflected light microscope.

Heazlewoodite and millerite from Kefdağ (Guleman-Elazığ) chromite mine have been previously studied in detail under reflected light microscope by Çağatay (1975). The results of that work are tabulated in Table I. The aim of this article is to complete the work done earlier by the addition of quantitative electron microprobe analyses of the mentioned minerals.

Table - 1

Optical properties of heazlewoodite and millerite

Mineral	*Color*	*Anisotropy*	*Reflectance (%)*	*VHN*	*Polishing*
Heazlewoodite (Ni_2S_3)	Yellowish cream	Moderate	51.0-49.3 (56.5)*	290-340 (231-321)	Very good
Millerite (NiS)	Pure yellow	Strong	(53.2-59.0)	(192-376)	Good

* Values in brackets are from Uytenbogaardt and Burke (1971).

Quantitative electron microprobe analysis of heazlewoodite and millerite were carried out at the Department of Geology, University College, London. The microprobe used was a Cameca MS 85, with a take-off angle of 15° and an accelerating potential of 15 KV. The analytical conditions are summarized in Table 2.

Table - 2

Analytical conditions

Element	*Standard*	*Spectrometer crystal*	*Spectral line*
S	Pyrite (FeS_2)	Mica	S K_α
Ni	Pure Ni	Quartz	Ni K_α

Several elements, namely Ni, S, Co, Pb, Fe, As and Sb were looked for in the specimens by scanning the samples with the spectrometers, but only Ni and S were found to be the major elements, the others (Co, Pb, Fe, As and Sb) could not be detected, i.e., their concentrations were below the detectibility limit of the instrument.

The results of electron microprobe analyses[1] (Table 3) were recalculated in the IBM 360 computer of University College, London, using the IC-BM-NPL program (I.M.S., Report no. 2, Mason, Reed & Ford, 1969).

Table - 3

The results of electron microprobe analyses

Element	Mineral-A	Mineral-B
S	28.86	34.65
Ni	70.51	64.43
Total	**99.37**	**99.08**
Crystalochemical formula	Ni_2S_3 Heazlewoodite	NiS Millerite

CONCLUSION

Quantitative electron microprobe analysis of the samples from Kefdağ (Guleman-Elazığ) chromite mine has confirmed the presence of heazlewoodite and millerite; a result which is in agreement with the work done by Çağatay (1975).

Heazlewoodite is characteristically found in serpentinized peridotites in assocciation with awaruite, pentlandite, shandite and magnetite. This Ni-sulfide mineral is suggested to be of hydrothermal origin (Ramdohr, 1967; Chamberlain, 1966; Naldrett, 1965; Kulagiv, 1967).

The presence of heazlewoodite in the Kefdağ chromite mine is thought to be closely related to metamorphic activity which resulted in hydrothermal action (Çağatay, 1975).

Millerite is an alterationl replacement mineral after heazlewoodite (Woodhouse & Morris, 1957; Ramdohr, 1969; Uytenbogaardt & Burke, 1971; Çağatay, 1975).

1 Electron microprobe analyses of heazlewoodite and millerite were carried out by Eşref Aydın.

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