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Hessite and electrum from the Ratagain intrusion, north-west Scotland

DURING a recent examination of some mineralized veins from the Ratagain intrusion, north-west Scotland, the minerals hessite (Ag_2Te) and electrum were identified. Because of the rarity of Au–Ag tellurides and primary, precious metal mineralization in the British Isles this occurrence is briefly described.

The Ratagain igneous intrusion consists dominantly of diorite, syenite, and quartz monzonite (Nicholls, 1951). It has a Caledonian age and is intruded into Moinian schists. The quartz monzonite in the south and east part of the intrusion has been faulted and contains many narrow quartz-calcite-fluorite veins which are sporadically mineralized. These veins are well exposed on the west side of Loch Duich, along the road to Glenelg (e.g. grid reference NG915195) and on the east side of the loch, along the road to Kyle of Lochalsh (e.g. NG939198). A variety of minerals have been identified in these veins—the most abundant being pyrite, chalcopyrite, sphalerite, galena, molybdenite, and rutile. In addition, hessite, tennantite, aikinite, and marcasite are locally abundant, whilst electrum and gersdorffite have a sporadic distribution.

The hessite and electrum occur late in the overall mineral paragenesis. The hessite occurs as small (*c.*0.4 mm), irregularly shaped inclusions in galena, often as myrmekitic intergrowths. The electrum is closely associated with the hessite, typically occurring as small (< 0.4 mm) ovoid inclusions adjacent to the hessite.

Table I : Microprobe analyses of hessite and electrum.

	1	2	3	4
Au	0.39	0.09	-	67.39
Ag	61.83	0.45	62.84	30.08
Te	37.13	0.51	37.16	0.03
S	0.17	0.08	-	0.03
Cu	0.38	0.27	-	0.07
Fe	0.14	0.15	-	0.09
Total	100.04	-	(100.00)	97.69

(All values as weight %)

1 = Hessite, mean of 9 analyses. Formula - $Ag_{1.97}Te$.

2 = Standard deviation (1σ) of 9 hessite analyses.

3 = Stoichiometric Ag_2Te.

4 = Electrum, mean of 2 analyses. Formula - $Au_{0.55}Ag_{0.45}$.

(Chemical analyses were obtained using an energy dispersive detector attached to a Cambridge Mark 5 'Microscan', under the direction of Ian Young, University College, London).

The hessite was identified by its characteristic optical properties (anisotropism, reflectivity, polishing softness) and confirmed by electron microprobe analysis. Table I presents the chemical composition of the hessite and electrum from this locality. The relative enrichment of Ag in the electrum points to the dominance of this metal during the latter stages of mineralization. Textural evidence suggests that both hessite and electrum formed at the same time by replacement of galena. Thus the low Au content of the hessite indicates that most of the available Au in the mineralization fluids was taken up preferentially by the electrum rather than by the telluride phase.

Although Bi-tellurides are relatively common at several localities in the British Isles, other Te-bearing minerals are rare. The only confirmed, but unpublished report appears to be the one by Gilbey (1968) who identified hessite and altaite (and possibly other species) from the Welsh gold belt. The Ratagain mineralization is clearly different from that described from Wales but bears superficial resemblance to examples described from other Scottish localities. In particular, the descriptions given by Pattrick (1984) and Gallagher *et al.* (1974) indicate that similar assemblages containing Au, Ag, Bi, As, etc. are associated with other Caledonian granitic rocks. Further study at these localities might reveal that precious metal telluride phases are more common than hitherto expected.

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