GEOLOGY 409

600235

BLACK DIAMOND TUNGSTEN PROPERTY

(a) Description of the Hand Specimen
(b) Microscopic Examination
(c) Paragenetic Sequence
(d) Classification of Deposit

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BLACK DIAMOND PROPERTY

(a) Description of the Hand Specimen:

The two hand specimens consist of white, fresh quartz which has sparse films and blebs of sulphide mineralization along fractures in the quartz. The mineralization is a mixture of:

1. Chalcopyrite - Told by its brassy yellow colour, hardness of 4, black streak, and non-sectility.

2. Galena - Has steel grey colour, 3 cleavages, and hardness of 2.

3. Bismuthenite - Steel grey colour, hardness of 2, and one cleavage.

The quartz on the weathered surface shows a reddy brown colouration which extends along fractures down from the weathered surface. A bleb of sulphides varies in size from 1mm to 8mm which is the same size for the films of mineralization along fractures. The cleavage of the galena is indistinct as though some movements along fractures has taken place after mineralization.

(b) Microscopic Examination:

The following minerals have been identified in the polished section and are listed below together with their optical data, microchemical and etch tests:

Mineral 1 - Galena

The surface shows scratches and coarse triangular pits. The colour is galena white, hardness of B, isotropic, nonpleochroic, and has {001} cleavage. The following are the etch tests:

$HgCl_2$, KOH, KCN	Negative
$FeCl_3$	Stains irridescent which is different from bismuthenite.
HCl	Tarnishes irridescent.
HNO_3	Blackens without effervescence

The galena occurs as fracture fillings in the quartz and has exsolution blades of matildite within it. It is also seen replacing bismuthenite along the cleavage planes. What evidence?

Mineral 2 - Bismuthenite

The mineral takes a good polish with the odd pit elongated parallel to the cleavage direction. Its colour is galena white and can only be told from galena because of its difference in etch properties. It has a hardness of B, anisotropism colours of light to dark grey, nonpleochroism, and {010} cleavage. The etch tests are:

$HgCl_2$, KOH, KCN, $FeCl_3$	Negative
HCl	Stains a slight orange colour.
HNO_3	Slowly effervesces and stains black
Aqua Regia	Stains black and effervesces.

The bismuthenite occurs as fracture filling in quartz and appears to be spatially associated with the galenobismutite and not the galena with which it only occurs in contact with once.

Mineral 3 - Galenobismutite:

In colour the mineral is a pale yellow when in contact with galena, although Short states that it is galena white. The mineral has a hardness of B, anisotropism colours of light to dark grey, and is nonpleochroic. The following are the etch tests:

$HgCl_2$, KOH, KCN, $FeCl_3$	Negative
HCl	Slight brownish-orange colour
HNO_3	Effervesces and stains black very quickly
Aqua Regia	Stains orange to irridescent and effervesces slowly.

Mineral 4 - Chalcopyrite:

The mineral takes a good polish and has a slightly higher relief than gold has, and the sctraches of the polish of gold are not showing. The hardness of C, weak anisotropism, and brassy yellow colour are distinctive. The following are the etch tests:

$HgCl_2$, KOH, KCN, $FeCl_3$, HCl, HNO_3	Negative

This mineral occurs in small grains which are isolated in the quartz or are at the boundary of the bismuthenite grains.

Mineral 5 - Matildite:

The colour of the mineral is galena white and looks exactly like galena from which it can be differentiated by etching and anisotropism..Its hardness is B, anisotropism colours of light to dark grey, no internal reflection, and nonpleochroic. The following are the etch tests:

$HgCl_2$, KOH, KCN	Negative
$FeCl_3$	This is supposed to be irridescent but it is not in this specimen.
HCl	Negative
HNO_3	Stains slowly to grey but is too small to tell if it effervesces.

Occurs as exsolution blades along the crystallographic {111} planes in galena in a Widmanstetten-like texture. (See Fig. 1).

The sulphide mineralization is present in the following quantites by volume

Galenobismutite	1%
Galena	60%
Bismuthenite	35%
Matildite	5%
Chalcopyrite	1%

This represents some 10% of the total volume of the specimens with

quartz representing the other 90%.

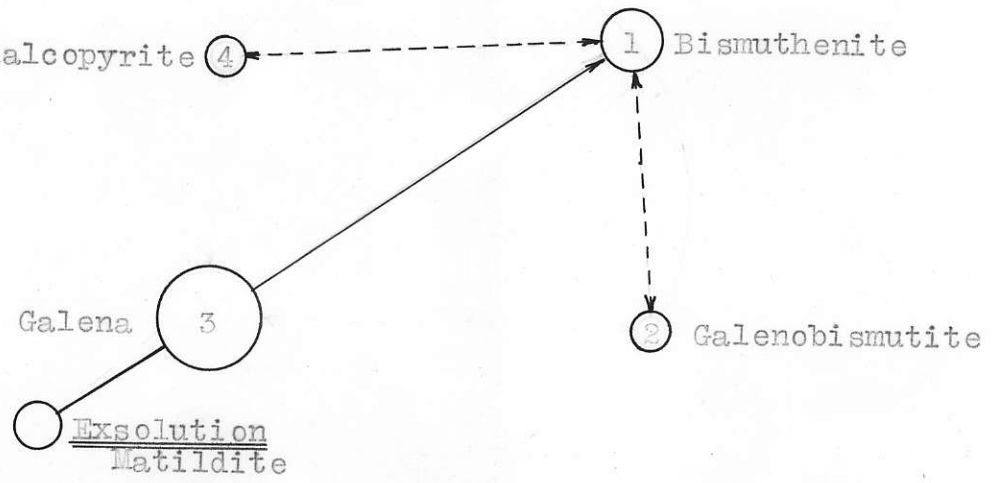
(c) Paragenetic Sequence:

Much difficulty is encountered in formulating a paragenetic sequence as minerals such as chalcopyrite is found in only a few isolated blebs and galenobismutite is found in only one bleb with no conclusive evidence as to its order of deposition.

Figure 3 shows the only place that galena was found in contact with bismuthenite. Here the galena has replaced the bismuthenite along the cleavage planes as the galena shows a direction of elongation parallel to the cleavage of the bismuthenite. In only one area does the galenobismutite contact the bismuthenite and here the evidence of age relationships are not definite as shown in Figure 2, although it is possible that the galenobismutite has replaced the bismuthenite.

Figure 1 shows the Widmanstetten-like texture of exsolution blades of matildite along the {111} plane of the galena. For this texture to exist the temperature of formation of galena and matildite was above 210°C (Edwards P 112).

Chalcopyrite is present as small isolated grains some of which are in contact with bismuthenite, but the relationship between the two minerals is not conclusive.



(d) Classification of Deposit:

In form this deposit is a fracture filling with some replacement as it has already been noted that the galena replaces bismuthenite. The exsolution pair of galena-matildite show that the deposit was formed above 210°C. Under Lindgren's classification this deposit would fall in the category -"In bodies of rocks where concentration and deposition is effected by the introduction of substances foreign to the rock. The origin of the foreign substances is dependent upon the eruption of igneous rocks. Deposition and concentration at intermediate depth - mesothermal deposit, temperature 200 to 300°C with high pressure."

emplacement ?

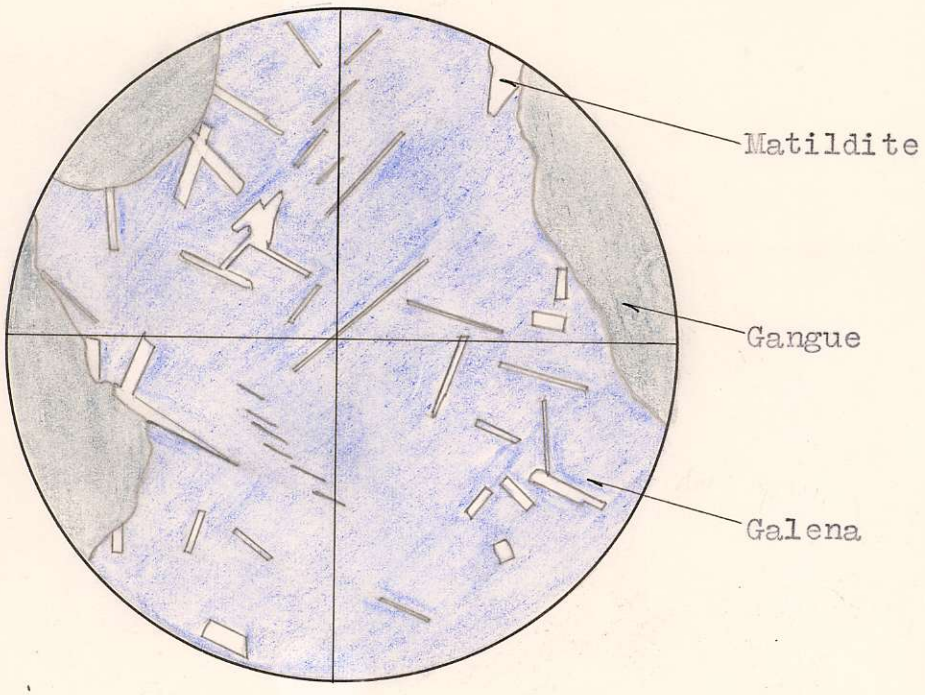


Figure 1 : Shows exsolution blades of matildite in galena.
x225 HCl etch

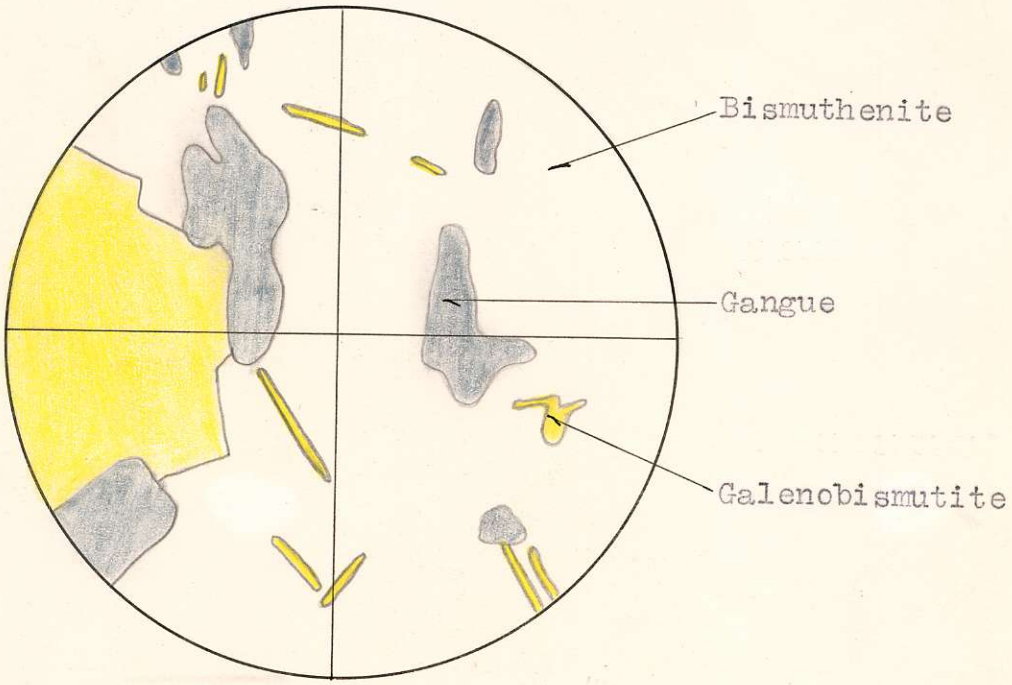


Figure 2 : Shows galenobismutite in bismuthenite. x225

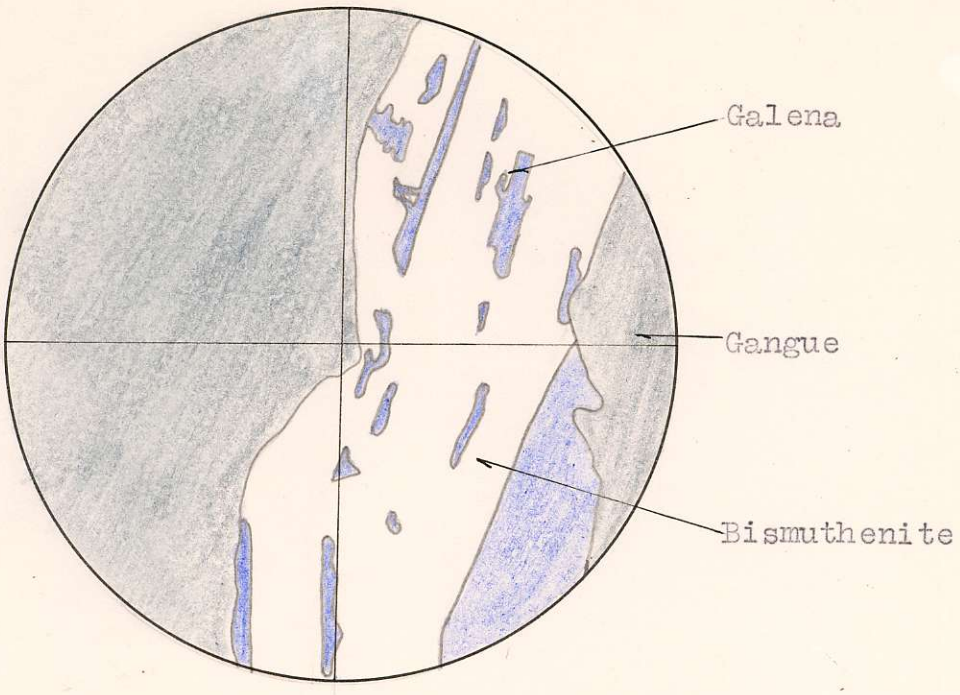


Figure 3: Galena replacing bismuthenite along 010 cleavage planes
$FeCl_3$ etch x225

RMT
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