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A MINERALOGRAPHICAL STUDY OF ORE SPECIMENS FROM WHITEWATER MINE, B. C.

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INTRODUCTION.

The Whitewater and Whitewater Deep groups consist of twenty-four Crown-granted claims and fractions, covering 507.73 acres and embracing the amalgamated Whitewater and Whitewater Deep groups of claims. They are owned by Whitewater Mines, Limited, Daslo, B.C. The property is on the north slope of Kaslo Creek walley on either side, but mostly to the west of the valley of Whitewater creek. The portal of the lowest adit is alongside a railway spur 2000 feet east of Retallack station.

The outcrop of the Whitewater lode was discovered in 1892. and the whitewater and Irene claims were staked. During this first year 7 tons of ore, averaging 200 ounces in silver and 50 % lead, were shipped. Development proceeded rapidly, until, in 1898, 120 men were employed and the property was regarded as the best paying mine in the district.

In 1904 a first shipment of zinc ore was made and carried good values in silver. In 1910 the entire plant was destroyed by fire, and for several years following, production was mostly by lessees whose small-scale operations in the vicinity of the old stopes of the upper mine afforded unusually hands - ome profits.

In 1923 the present organization, Whitewater Mines, Limited was formed. This company acquired both the Whitewater and Whitewater Deep mines.

Production in 1924 and 1925 amounted to 765 tons averag- ing 65 ounces in silver to the ton, over 15 % lead, and about 15 % zinc. In 1926 the production amounted to 9839 tons, and in the following year, 5,558 tons. The output was much heavier in 1928 when the company was able to take advantage of its own milling facilities; it is recorded at 24,553 tons.

The last report on the Whitewater Mines in the "Annual Report of the Minister of Mines for British Columbia" is in the 1937 edition. Here it is reported that the Whitewater mine closed late in 1937, and that during 1937, 23 tons were shipped directly to the Trail smelter, yielding 2 oz. of Au, 1962 ounces of silver, 26,450 lbs. of lead, and 3842 lbs. of zinc. Further, from the 56180 tons milled, 674 tons of lead and 2,135 tons of zinc concentrates were obtained. The concentrates of the former class yielded 33,606 oz. of silver, 594,440 lbs. of lead and 121,240 lbs. of zinc. The zinc concentrates yielded 2302 oz. of gold, 8,132 oz. of silver, 44,333 lbs. of lead and 14,823 lbs. cadmium, and 1,952,815 lbs. of zinc.

GENERAL GEOLOGY.

At Whitewater mine the rocks are mostly carbonaceous slate, slaty argillites, and impure limestone beds lying towards the base of the "limestone" zone of the Slocan series, a zone containing an abundance of slaty argillaceous rocks but particularly characterized by a number of thick limestone strata. Interbedded with the slate and limestone in the vicinity of the Whitewater and adjoining properties are a few beds of quartzite whose outcrops are commonly distinguished by their grey colour, massive structures, and by a network of quartz veins and lenses. The sediments strike from nearly east to nearly southeast. The general dip is to the south or southeast, but the structure is complicated by minor folds and faulting so that northerly dips are observable both underground and at the surface.

The great width of limestone is noteworthy of the Whitewater Deep mine. It is a rock more susceptible to replacement than the slaty, argillaceous types encountered in the upper working and explains the occurrence and great width of some of the ore-bodies in these lower levels.

No. 14 crosscut, the main working adit, has exposed a cross-section of the formations encountered underground. For 14oo feet from the portal the rocks are mostly platy argillites or slates, interbedded with some more blocky quartzitic bands. In this distance a great number of fissures were observed, some of which show a little mineralization. Between 1,400 and 1,800 feet from the portal the crosscut passes through a thick belt of limestone and limy sediments that appear to be continuous with a thick limeston belt outcropping northwest of the wagon road west of the portal of No. 10 level.

ORE BODIES.

The ore bodies at the whitewater mine are associated with a strong zone of fissuring and shearing referred to as the Whitewater lode. This lode varies from a foot or more to 50 or 60 feet in thickness and, in the upper levels, where it has been most consistently followed, probably averages 5 feet wide.

The ore-bodies of the upper and lower workings are of quite different types. In the upper levels the mineralization is concentrated along the Whitewater lode which occurs mainly in slaty, argillaceous sediments. The lode filling is composed of crushed rock, siderite, quartz, and ore minerals and shows evidence of considerable movement and shearing with development of much carbonaceous gouge and slickensided ground. The ore-bodies of the productive zone in this lode rake 30 degrees to 35 degrees east. The ore minerals in the productive zone are galena, zinc blende, grey copper, and oxidized products, with some copper and iron pyrites. The associated gangue is chiefly siderite, but some quartz is present. The ore as stoped from these upper workings occurred in streaks and lens-like masses.

In the deeper workings the Whitewater lode at different places appears to have spit into parts of about equal size that follow courses at a small angle to one another. Such a condition has made crosscutting and exploratory drifting.

Work on and between levels 12 and 13 has afforded very important results. These workings have explored a great width of limestone and limy sediments, No. 12 level exposed in the limestone belt a system of fissures running from the hanging-wall of the Whitewater lode. These fissures, which led to the opening up of the main ore body, were the channels by means of which the mineralizing solutions gained access to the limestone belt which has been widely replaced by ore and gangue minerals. Though more pronounced in the vicinity of the fissures, the replacement has tended to follow the bedding structure of the limestone belt.

The main ore-body was composed of a series of overlapping lens-shaped bodies verying in thickness up to 30 feet or more. Each lens was a mixture of ore and gangue materials in varying proportions. The characterisitc ore consisted of interbanded siderite and zinc blende with partly replaced limy rodk. More or less galena was generally present in either banded or disseminated form and also as pockets of cubes. Solid or nearly solid masses of zinc blende 9 or 10 feet thick were encountered. Banded structures were commonly well shown and conformed with the bedding.

MINERAL SPECIMENS.

Sections were cut from seven samples of Whitewater ore, mounted in Damar gum, polished, and then examined.

The ore minerals found, in their order of abundance, were Sphalerite, Galena, Pyrite, Chalcopyrite and Tetrahedrite. Gangue minerals included Quartz and the carbonates, Calcite and Siderite, siderite being the most abundant.

Specimen No. 1.- (Whitewater A)
Remnants of calcite in sphalerite; Galena; pyrite and some siderite.

Specimen No. 2.- (Whitewater A)
Same as specimen no. 1.

Specimen No. 3.- (Whitewater 1)
Chalcopyrite spattered throughout sphalerite; Galena; siderite; and isolated crystals of pyrite.

Specimen No. 4.- (Whitewater 1)
Siderite and calcite veined by pyrite and replaced by galena and sphalerite.

Specimen No. 5.- (Whitewater 1)
Chiefly fine grained pyrite healed by quartz and intimately associated with chalcopyrite; tetrahedrite (the only specimen in which it was found) and a light gray mineral, slightly anistropic and having a gray to purple colour in polarized light, apparently associated closely with chalcopyrite which it appeared to be replacing. (On the hunch that this might be the mineral responsible for the tin content of the ore, tin michrochemical tests were tried but were unsuccessful. Tests were obtained for iron and copper, but these could be due to the surrounding chalcopyrite)

Specimen No. 6- (Whitewater No. 6)
Mainly sphalerite, traversed by numerous fine stringers of pyrite and chalcopyrite.

Specimen No. 7 (Whitewater No. 7)
Quartz associated with pyrite: sphalerite remnants in quartz, the boundaries of which show pyrite crystallization: galena.

PARAGENESIS.

The fissures and shear zones of the present day Whitewater lode were probably first traversed by iron-bearing ground water which transformed the calcite into the secondary gangue mineral, siderite.

Mineral laden solution arrived later, from which sphalerite and chalcopyrite precipitated, the chalcopyrite appearing in some of the specimens as minute round specks and grains embedded in the sphalerite.

A period of replacement then appears to have taken place, during which pyrite and chalcopyrite were left distributed in the fine sphalerite grain boundaries. Quartz evidently came in at the same time for it was observed (fig. 3) surrounding and healing the individua l pyrite grains. Some of the pyrite veined the calcite and siderite. Fracturing previous to this replacement was suggested by the network nature of the pyrite veins in the sphalerite, although the fineness of these veins made it appear unlikely.

The galena and tetrahedrite, neither of which show any evidence of fracturing or veining by pyrite or chalcopyrite, and both of which appear to replace the sphalerite, were probably deposited during a third mineralization epoch.

The order of galena and tetrahedrite with respect to one another is uncertain since in none of the specimens could they be found together. However, it is more than probable that they occurred together.

The unknown mineral, mentioned above, appears only in close contact with the chalcopyrite (second generation), which it appears to be replacing.

The above reasoning suggests the following order of mineral occurrence in the Whitewater lode.

1. Calcite.
2. Siderite.
3. Sphalerite and chalcopyrite.
4. Pyrite, chalcopyrite and quartz.
5. Tetrahedrite,
   Galena ?
   Unknown mineral.

Alternative theory.-

It should be pointed out that at least two of the specimens indicate, by the parallel orientation of the Sphalerite and galena, and of the sphalerite and tetrahedrite, that these minerals along with the copper minerals and quartz were all brought in by the same mineral bearing solution. Crystallization, due to the varying saturation points in the solution of the minerals concerned, occurred at different times. That the sphalerite crystallized out first, (accompanied by a small amount of chalcopyrite), is indicated by the evidence above, and, as well, by the observed fact that it, only, makes contact with the calcite of the former fissure walls.

This explanation does not alter the order previously arrived at , but replaces the idea of three mineralization periods, by one period, in which all the ore minerals found in the lode arrived together and crystallized preferentially.

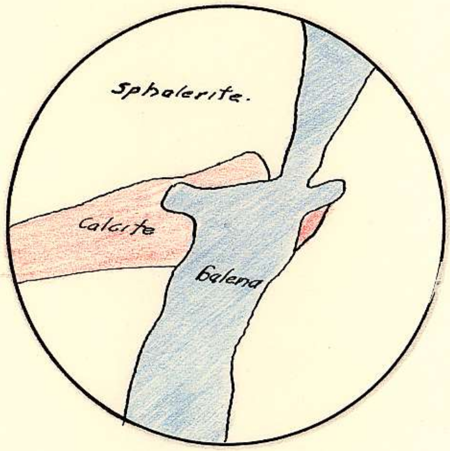

Fig. 1.
Specimen No. 1

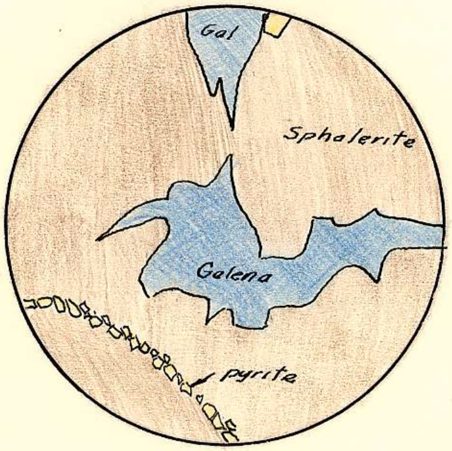

Fig. 2.
Specimen No. 1.

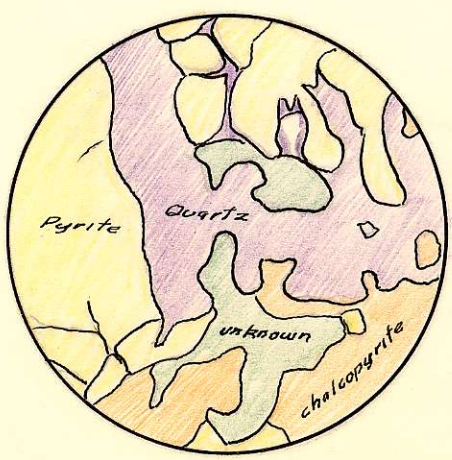

Fig. 3.
Specimen No. 5.