The An-tu Antimony Mine

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I. Location and Access

Ta-tien-tzu of An-tu is located at 70 km west-southwest of Ming-yueh-kou station on the Chang-chun—Tu-men Railway line. The antimony ore deposits occur at about 9.5 km directly west-northwest of Ta-tien-tzu. Taking the road through Hsi-pei-chai, the distance from Ta-tien-tzu to the deposits is about 15 km; the road is very poor and hardly passable for trucks.

II. Geology and Ore Deposits

There are two ore deposits centering around Ta-tien-tzu, one is called the Hsi-pei-chia deposit and the other Wan-pao-kai-tzu deposit. The latter deposit was once prospected but was later abandoned, so the present report deals only with the Hsi-pei-chia deposit.

The ore deposit at Hsi-pei-chia was previously reported by Uchino and Asano (1939). I will describe the deposit on the basis of my own observations made in August, 1945, and referring to Uchino and Asano's reports as well.

The Hsi-pei-chia area is composed of leucocratic biotite granite, the Upper Paleozoic Tou-man formation captured or intruded by the granite, hornfels, and the Jurassic formation.

The granite might have intruded in the late Paleozoic or early Mesozoic period. It is pinkish or pale reddish brown, and fine- to medium-grained. Although biotite occurs as a mafic mineral, the rock is generally leucocratic. Essential minerals are labradorite, microcline, orthoclase and quartz, accompanied by muscovite as well as biotite. Apatite and magnetite are present as accessory minerals.

The hornfels, probably belonging to the Tou-man formation, occurs as xenoliths in the granite north of the ore deposit. Xenoliths of limestone are found around the deposit.

The Jurassic formation consists of basal conglomerate, sandstone and shale. The formation is well exposed at Nan-ta-tien-tzu where the occurrence of *Podozamites* sp. is noticed. The formation strikes N 80° W and dips 12° S. The sandstone is generally grayish white, locally intercalated with reddish purple sandy shale. The

basal conglomerate is exposed near the deposit. It is composed of pebbles of the above-mentioned granite, and the interspaces of the pebbles are partially filled with stibnite.

Prospecting of the ore deposit is still insufficient, but outcrops of the deposit and boulders of ore are found in places. In most cases, ore occurs in the leucocratic granite. Crystals of stibnite are found in the silicified portion of the country rock. In some cases, however, stibnite fills the interspaces of pebbles of the Jurassic conglomerate, as observed in the Kinen (Memorial) mine lot. Stibnite is found mostly as small prismatic crystals, 1 mm to several centimeters long, scattered throughout the silicified zone. On rare occasions, prismatic crystals as long as 20 cm aggregate into a bundle. A small amount of pyrite is often associated with stibnite. The gangue mineral is mostly quartz. Thus, the mineral assemblage of the ore is very simple. According to the result of prospecting the deposit of the Kinen mine lot is most promising.

A. Ore Deposit

Mode of occurrence of the ore deposit is hardly observed on the ground, since the exposures are poor. On the surface the deposit looks like a silicified part of the leucocratic granite. However, underground observation reveals that the deposit fills the interspaces of the pebbles of the conglomerate which unconformably rests on the granite, and extends with a trend of roughly N 30° E. Prospecting was carried out by digging nine pits (represented as shafts on the map), of which the following five encountered the ore:

Pit No. 1:—A shaft was driven in the direction of N 30° E. A very small amount of stibnite was noticed in the granite near the entrance.

Pit No. 2:—When a shaft was driven for 10 m in the direction of S 42° E, three ore veins were found within a width of 3 m. The veins strike N 30° E, dip 80° NW or vertical, and join those in Pit No. 3 in the south.

Pit No. 3:—The ore veins were pursued by driving a shaft. At the bottom of the shaft, a drift was driven along the ore veins whose trend changed to N–S. By a westward cross-cut the drift is connected with the level of Pit. No. 5.

Pit No. 5:—After a shaft was driven for 10 m, an inclined drift was driven. Because of the winding of the drift it is difficult to assume the mode of occurrence of the ore deposit, but a mineralized zone, about 4 m thick, contains several ore veins striking N 30° E and dipping vertically. From the bottom of the drift, a level was driven to join No. 3 in the north and No. 6 in the south.

Pit No. 6:—A cross-cut driven in the direction of S 75° E met with an ore body at a spot 10 m from the entrance. From this spot a drift was driven to pursue the ore body. Another cross-cut, 15 m long, was also driven from the same spot. The observation in this cross-cut revealed that the ore body lies in the conglomerate consisting of granitic pebbles. The conglomerate contains fragments of carbonized wood. Judging from the geologic setting of the neighborhood the conglomerate is supposed to be Mesozoic (Jurassic?) in age. Prismatic crystals of stibnite, 1 mm to

several centimeters long, are filling the interspaces of pebbles in a radial pattern or forming irregular aggregates. The mode of occurrence of the stibnite crystals may represent the structure of the conglomerate. The country rock is bleached white and the thickness of the sericitized zone is more than 5 m, but the ore-bearing part is about 2 m thick. The ore body branches into veins in the direction of N 30° E. A fractured zone stretching in this direction is mineralized.

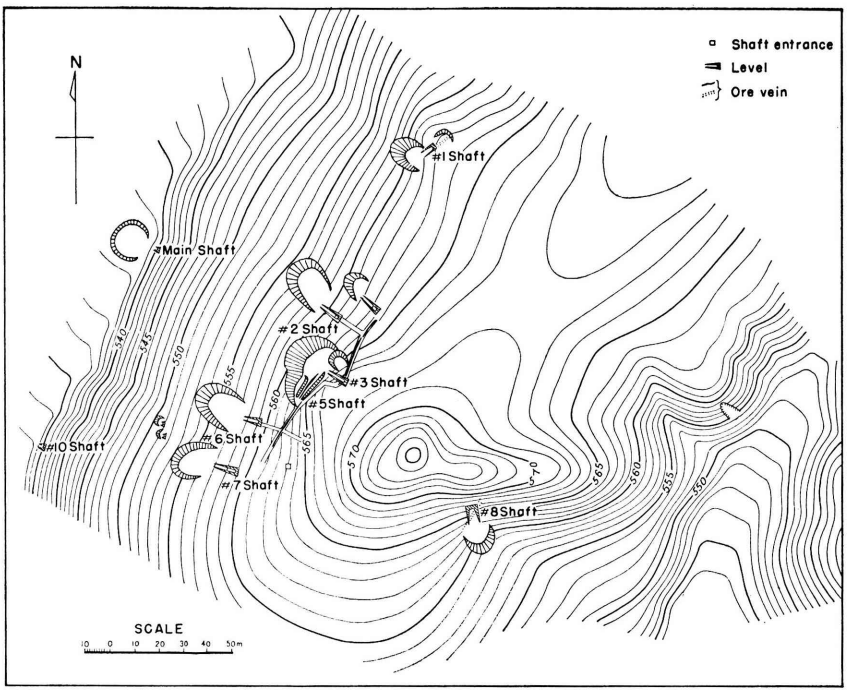

Fig. 1. Sketch map of An-tu mine (antimony).

B. Grade and Reserves of Ore

The above-mentioned prospecting pits are all very shallow, 4 to 8 m from the ground surface, but it was confirmed that the ore deposit has an extension of 60 m between Pit No. 2 and Pit No. 6, and its northern extension is impregnated with stibnite. Taking Pit No. 1 into account, the extension of the ore deposits would amount to at least 100 m. Ore veins are 2 m thick on the average and the stibnite content is 1.0 to 1.2% judging from the record at the time of my investigation in 1945. Due to the topographical conditions it is difficult to drive a new cross-cut at a depth more than 20 m. Therefore, exploration of the deeper part would not be accomplished in a short period of time.

Assuming that the ore deposit continues down to the depth of 30 m, I estimated the probable reserves of ore as follows:

$$100 \text{ m} \times 30 \text{ m} \times 2 \text{ m} \times 2.6 = 15{,}000 \text{ tons}$$ (2.6 is specific gravity of ore)

If the ore was mined at a rate of 1,000 tons per month, the reserves would be

exhausted within about 15 months. Under the existing circumstances it is advisable that the mining is operated by a private enterprise with its own refinery, aiming at the monthly output about 500 tons.

III. Mining Situation

At the time of the investigation, the An-tu mine was operated by a private company, the Continental Mining Company. Working at the mine site were one Japanese engineer, several Korean employees and 20 to 30 Manchurian laborers. Crude ore was treated by means of gravity concentration, and was transported by truck to the refinery across a stream near Ming-yueh-kou station. At the refinery the ore was refined into metal antimony by means of a simple pot-shaped smelting furnace equipped with crucibles. One Japanese and several Koreans were working there. The company had experienced hard times since the Manchurian Incident, and in April 1945 they finally stood a fair chance of success in the mining business. They drafted a plan for a monthly production of 5 tons of metal antimony.

The Kinen mine lot was the main source of supply, however, prospecting of the ore deposit had just begun, and unless the downward extension of the deposit was confirmed it would be difficult to attain the goal, since 1,000 tons of crude ore would be required in order to produce 5 tons of metal antimony.

IV. Conclusion

The ore deposit of the An-tu antimony mine is a network of quartz in silicified zones along the fissures of the leucocratic granite and the overlying conglomerate. Outcrops and boulders of ore are found in places around the mine site.

The ore minerals are stibnite, occurring as prismatic crystals of 1 mm to several cm long, and a small amount of pyrite. Crude ore is easily crushed and is suitable for gravity concentration. The largest deposit lies in the Kinen mine lot, which is 100 m long, 2 m wide and with a stibnite content about 1%. Several outcrops and boulders of ore are found nearby.

It is considered that the development of this mine will cast some light on the development of similar deposits in Manchuria, including the ore deposits at Ching-tsui-tsu of I-tung Hsien and Hua-shu-lin-tzu of Hua-tien Hsien.

References

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