

THE ANTIMONY ORES OF SHIU CHOW, CHINA

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About 120 miles north of the city of Canton in the Province of Kwangtung is the city of Shiu Chow. It stands at the junction of two considerable streams which come down from the mountain borders of the Province and unite to form the Pei Kiang. The place can be reached by rail from Canton, and when the line is completed from Chu Chow to Shiu Chow, one can also reach it from Hankow by way of Changsha.

The rocks of the region are very deeply weathered limestones, sandstones, and shales of Middle Paleozoic age. The strata have been elevated in rather closely pressed folds whose trend is about $N10^{\circ}E-S10^{\circ}W$, and the dips range around 80° . No igneous rocks are known in the vicinity, although careful inquiry was made of the young man in charge of the mines, who has been college trained in Tientsin. In fact, a careful watch for igneous rocks for many miles along the railroad and over the hills failed to disclose a single outcrop.

In this part of China all travel, except by the railroad and the stream, is on foot over dirt roads or roads made of single stones laid along the path. Some of the foot-men carry chairs in which an occasional passenger could ride, but no wheeled vehicles are used at all, and scarcely any beast of burden. The ore from the mines is carried out some five or six miles on the backs of common coolie carriers, most of whom were women when seen in the summer of 1921. About two hundred carriers were engaged in transportation. Most of them make three trips per day, some only two. A strong man will carry about 130 pounds to a load; some are content with 80 to 100 pounds, and they receive the munificent sum of 25 cents a picul, which is equivalent to about 140 pounds. Thus these hard workers obtain from about 45 to 75 cents per day Chinese, and walk twenty to thirty miles, loaded one way.

The common mineral of antimony found in this locality is stibnite. It occurs in beautiful splendid crystals of characteristic color, and ranging in size from needles up to an inch through. A few of the prisms are striated parallel to the c -axis, but in most cases are parallel to b , and very regular and beautiful. Some of the prisms are curved; a very few seem to be capped with pyramids. Often a radiate arrangement is observed, but the commonest ar-

rangement is a criss-cross of prisms filling more than half the space. Calcite as gangue completes the vein.

The vein in which the ore occurs has a known width of about 4 feet; in some parts it is massive, with practically nothing foreign between the crystals of stibnite. In other places the stibnite is scattered through coarsely crystalline white calcite. This association with calcite seems to be a rather unusual occurrence for stibnite, quartz being the usual gangue. But in this Shiu Chow occurrence no quartz at all was found with the stibnite. On exposure the stibnite usually tarnishes to an iridescent blue, but some parts remain nearly black, and others stay gray. A careful search has revealed no pyrite at all in the vein.

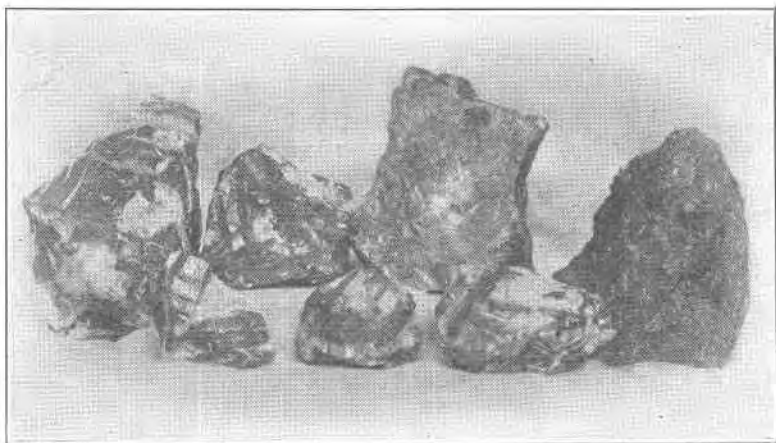


FIGURE I

Left, calcite-veined limestone; right, stibiconite; small pieces, calcite and stibnite; center large piece, stibnite.

The country rock is a dark blue to dark gray massive limestone, containing many white calcite veins, some of which are an inch or two in thickness. The small veins are scarcely traceable without a lens. In this limestone near the veins, pyrite in very small crystals is of frequent occurrence and small quantities of stibnite also are found. Where the stibnite is found in the limestone it is worked until the percentage falls below 5%. The stibnite in the limestone is not well crystallized; in fact, often resembles a black sheet of slickensided clay. There is very little iron in these deposits except the pyrite.

Toward the surface the ore is weathered by oxidation and hydra-

tion to a yellowish gray or white heavy rock which runs 50% to 55% antimony. No anhydrous minerals were found, such as cervantite, valentinite, and senarmontite, but stibiconite is common. It is usually massive and varies in color from a lemon yellow through orange to white. It is rarely crystalline enough so that crystal forms can be identified, but small crystals can be seen with the lens. Several percent of milky quartz occurs with the ore in this weathered zone.

A number of shallow shafts have been opened in search for the ore, but none of these found anything beside float. A horizontal tunnel has been run straight back into the mountain, and this has encountered the four-foot vein mentioned above. The shaft and finds in the stream bed, together with the collection of float all along the hillside up to the line of the vein, make it clear that the deposit has considerable north and south extent.

About 12 or 13 miles south and southwest from these deposits, float ore is also found and brought to Shiu Chow to the smelter. This second deposit is along the strike of the rocks and suggests that the vein may be successfully traced the entire distance, for the ore is found between limestone and a shale, both of which occur at the second locality. Again about 33 miles north by northwest from Shiu Chow are small native workings for antimony in float and in the stream bed. Very pure stibnite from this locality is also brought to Shiu Chow.

All the work in this entire region is carried on by the simple laborious native methods. Ore and waste rock are removed in baskets on carrying poles or carried in the hands. Hoisting is done with a hand windlass. In the horizontal tunnel, small baskets are used. Tools are of the crudest sort, little hand drills and hammers, and occasionally a little blasting are all that are ever used for breaking up the rock. Fortunately the ore is not far up the mountain-side, but can be easily reached over the stony, tortuous foot-paths, and without any severe climbing.

This deposit seems to be peculiar in what it does not contain, for the gangue is almost free from quartz. No copper or lead or zinc is known with the stibnite, and the only weathered product found is the hydrous oxide, stibiconite. Mineralogists will be interested in following the development of this deposit, because of these differences from the ordinary antimony ores, and as the work proceeds, something else may be discovered. At present it is essentially a stibnite-calcite vein in massive Paleozoic limestone, produced without igneous activity.