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COPPER ORE OCCURRENCE KYAUKSE, BURMA

With 2 figures in the text and 2 figures in the enclosure

A copper ore occurrence is located about 14 miles west of Kyaukse near the village of Pyaukseikpin. The approximate coordinates of the locality are 21° 33′ N. Long. and 96° 20′ E. Lat. (Fig. 1 and 2).

The area is a hilly one. It belongs to the western rim of the Shan Plateau, to a portion which just emerges in very conspicuos forms from the big plains of the Irrawaddy River. The elevations range from 350 to 2700 ft. The main drainage channel with perennial water is the Taunghla Creek. All the other creeks are dry during the open season.

In the past the deposit Kyaukse had been subjected to extensive explorations. The first were presumably Chinese miners who sank some pits and made the excavations on the western outcrops of the vein. Later, in the first decade of this century, Messrs. Jamal Brothers undertook extensive exploration works. Altogether 7 adits (some of them with drifs and crosscuts) and 5 deep shafts and 2 pits were completed, but the mining activities were stopped owing to lack of ore reserves.

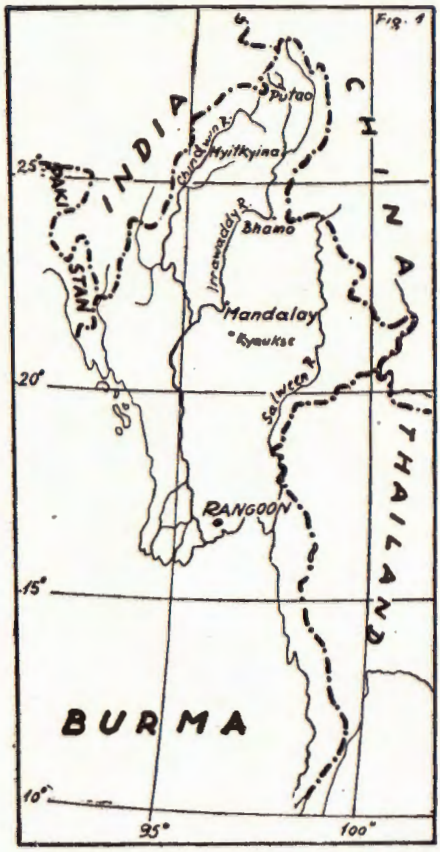
There is no mention of this deposit either as a copper or gold deposit in Chibber (1934) or Clegg (1944).

The mineralized area is composed of limestone with thinner or thicker intercalations of sericite-phyllite shists. The limestones are thin-bedded or even sheated, but there are also layers of massive limestone.

The most interesting mining working is adit No. 1 (fig. 3), located on the western slope of the mentioned low range. The adit is about 210 ft. long, and it cuts the ore vein at a distance of nearly 135 feet from the mouth. The ore vein was followed by a drift about 135 feet long. At first, the ore vein is about 3 feet thick, consisting of tetrahedrite, chalcopyrite, quartz, siderite, azurite, malachite and limonite. Further along the drift the ore vein decreases in thickness and eventually diminishes again to appear on the face of the drift. The ore wein strikes in an almost north-southerly direction, dipping with 70–75° towards the east. Stainings of malachite in the quartz vein were noticed in the short adit No. 4 on the western point of the range. All the other above-mentioned mining workings failed to prove the existence of an ore vein.

Mineragraphic studies of ore samples performed by Dr. Ivan Jurković proved the presence of the following minerals:

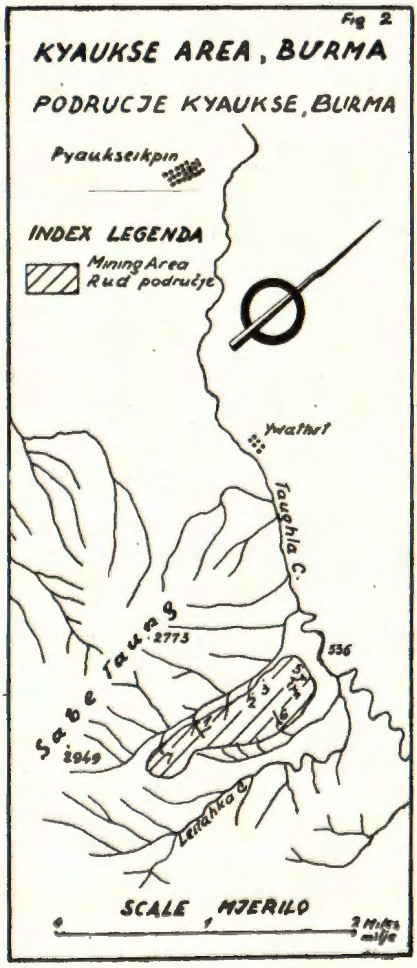
hypogene: *Quartz I*	supergene: *Covellite*
Quartz II	*Chalcocite*
Pyrite	*Azurite*
Tetrahedrite	*Malachite*
Chalcopyrite	*Goethite*
Siderite	*Lepidocrocite*



MICROPHYSIOGRAPHY OF MINERALS

Quartz I is the most abundant and at the same time the main gangue mineral. Its grains vary in size, from 0,15 to 1 mm, and they are dentadly intergrown. Their shape is either sometric or elongated. This quartz I is in some places brecciated: angular and subangular fragments

are cemented with a fine-grained quartz II. Quartz I is very often optically anomalous; it shows an undulatory or irregular extinction. A part of quartz I is cracked, the cracks are cemented with a fine-grained quartz II.



Quartz II occurs in small quantities, as veinlets or cement in quartz I. It is accompanied by sulphide minerals. Quartz II varies in size, ranging from 0,1 to 0,3 mm. The grains are translucent and optically normal.

Pyrite is very rare and occurs in microscopically small quantities. It is older than tetrahedrite and chalcopyrite, because it is met in them as very fine corroded grains.

Tetrahedrite is the most frequent and the most important ore mineral. It fills the pores and interstices of quartz I. Sometimes it fills the ore vein. Tetrahedrite is ligh-grey in colour, characteristic for antimonian tetrahedrite. Usually it is caught by weathering producing chalcocite, covellite, malachite, azurite, goethite and chalcantite. The first phase of the process of weathering consists in the development of an irregular system of microscopically fine veinlets and branchlets filled especially with basic sulplates, or in the zone of supergene enrichment with covellite and chalcocite. In a later phase there appear basic carbonates and goethite. In some samples the process of weathering was very intensive, so that only remnants of tetrahedrite within a mass of secondary minerals remained. In the tetrahedrite numerous minute masses of chalcopyrite, and sporadically very fine grains of corroded pyrite are to be seen.

Chalcopyrite is a frequent mineral but occurs in rather small quantities. In nearly every mass of tetrahedrite there is some chalcopyrite. According to the forms we may easily conclude that chalcopyrite was crystallized simultaneously with tetrahedrite; exceptionally its crystallization took part prior to the crystallization of tetrahedrite. Chalcopyrite is more resistent to weathering than tetrahedrite. It weathers mainly along the contact with tetrahedrite, producing covellite and chalcocite.

Siderite occurs as veinlets in quartz I, replacing it simultanously. Siderite is coarse-grained. Along cleavage planes it weathers to goethite.

Malachite is the most frequent hypergene mineral forming radially-fibrous bundles or sporadically granular aggregates. The adjacent gangue minerals are usually impregnated by malachite. Very often it is associated with azurite.

Azurite is not so frequent as malachite. It differs from malachite by its azure blue internal reflections, which are well to be noticed in crossed nicols.

Chalcocite is a hypergene mineral developed by alteration of tetrahedrite and chalcopyrite. It is microcrystalline and isotropic.

Covellite is also a product of alteration of tetrahedrite and chalcopyrite. It is predominantly fine-grained. Locally, bigger foliae of covellite are spread all over the masses of tetrahedrite. Such larger crystals of covellite display a perfect cleavage along (0001), all along which the process of weathering, mostly to malachite, started.

Goethite is a product of the alteration of tetrahedrite, chalcopyrite, siderite and, together with *lepidocrocite*, of pyrite. It is micro- or cryptocristalline.

SEQUENCE OF MINERALIZATION

Accordingly the sequence of mineralization is as follows: Quartz I is the oldest and main mineral in the paragenesis. In the phase of sulphides and sulphosalts the oldest is pyrite, but it is very scarcely spread.

Tetrahedrite and chalcopyrite were simultaneously deposited, but tetrahedrite is by far more abundant than the latter. Tetrahedrite is probably a gold- and silver-bearing mineral. Copper minerals are accompanied by a fine-grained quartz II. Siderite is the latest mineral in the sequence of the mineralization.

With the increasing of the relative depth the ore tenor decreased rapidly. Adit No. 1 is situated at a level of 755 ft. and has the highest tenor of copper, but adit No. 4, where the ore is much leaner, consisting mainly of stained quartz, is located at an elevation of 625 ft. Adit No. 5, which is only 30 feet below adit No. 4, did not strike any ore or even quartz vein (fig. 4).

The copper deposit Kyaukse is a typical mezothermal tetrahedrite deposit of the veiny type. Such a type of copper deposit is of no appreciable economic value, but it can be a conspicuosly gold- and silver-bearing deposit, as proved by Jurković (1956, 1957a, 1957b and 1960) on a number of Yugoslav tetrahedrite and quick silver deposits.

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POJAVA BAKARNIH RUDA KYAUKSE U BURMI

Rudna pojava se nalazi u Južnim Šan Državama u Srednjoj Burmi. Prve istražne radove izveli su Kinezi, koji su i vadili rudu u manjim količinama. Početkom dvadesetog stoljeća izrađeno je više potkopa, okana, hodnika na visinskoj razlici od 55 m i tim radovima žica je praćena na dužini od 45 m. Radovi su obustavljeni zbog malih količina rude u rudnoj pojavi i zbog isklinjenja u najnižem horizontu.

Orudnjenje se nalazi u tanko ili debelo uslojenim vapnencima koji sadrže uloške sericitskih filita.Rudna žica je vrlo promjenljive debljine: od nekoliko cm pa do 1 m, ali su opažaena i mjestimična isklinjenja.

Rudna pojava je u stvari kvarcna žica sa tetraedritom kao glavnim rudnim mineralom. Uz tetraedrit ima zamjentljivih količina halkopirita i vrlo malo pirita. Sulfide i sulfosoli prati sitnozrnati kvarc druge generacije. Mlađe žilice siderita presijecaju kvarc.

Bakarni minerali i pirit su u manjoj ili većoj mjeri rastrošeni u malahit, azurit, kovelin, halkozin, getit i lepidokrokit. Najviše ima malahita.

U prvoj fazi mineralizacije izlučen je kvarc I, zatim male količine pirita. Slijede gotovo istodobno tetraedrit i halkopirit. Siderit je znatno mlađi. Sulfide prate male količine kvarca II.

Rudna pojava je tipična mezotermalna kvarcno-tetraedritska žica. Tetraedrit je nosilac izvjesnih količina zlata i srebra.

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FIGURE III – SLIKA III

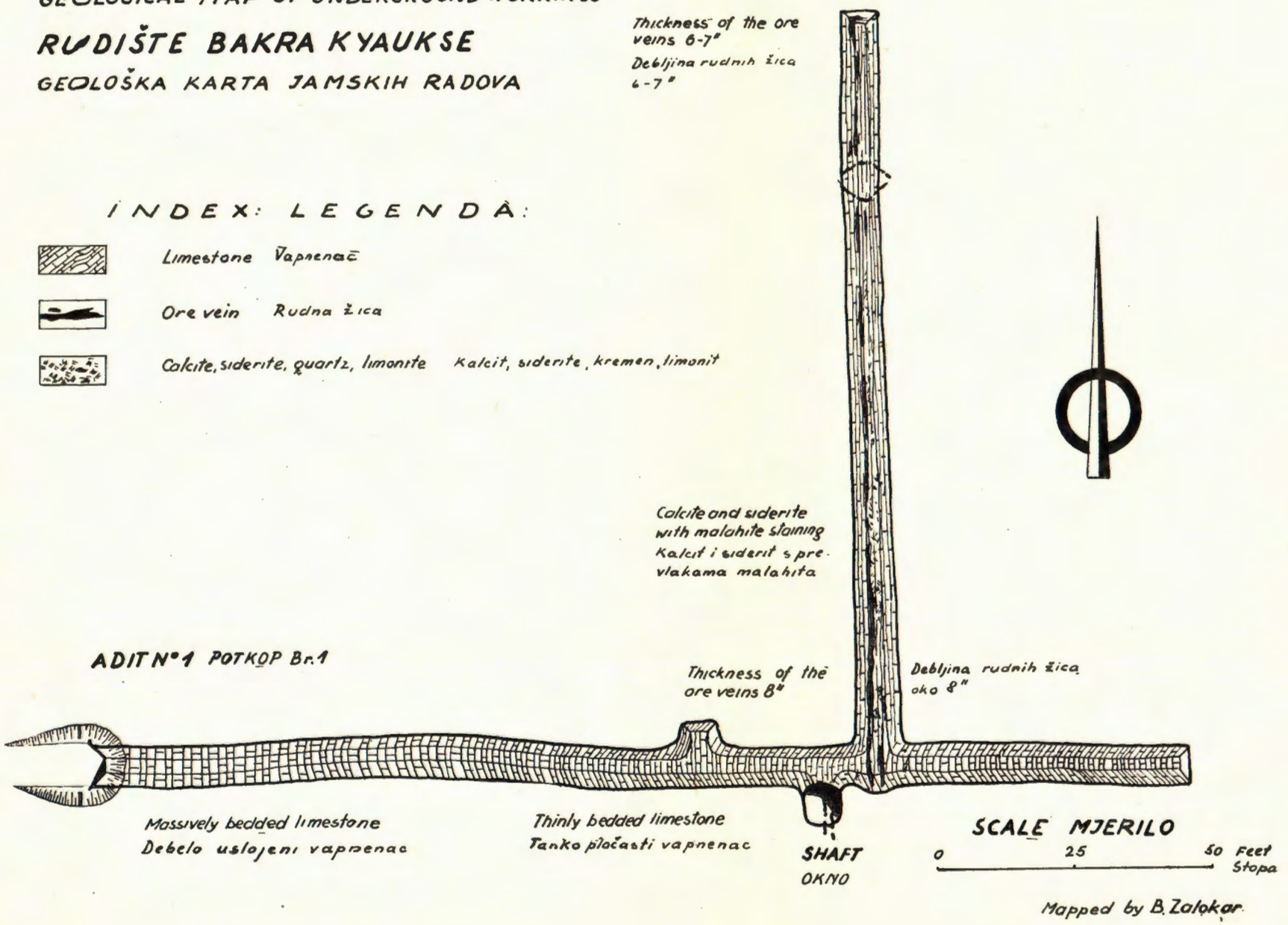

FIGURE IV – SLIKA IV