PROGRAM OF THE TECHNOLOGY TRANSFER THROUGH THE PLANT OPERATION

By

Ing. Federico de Zuñiga and Dr. Noriyuki Fujii

1. Annual master plan

With the progress of the plant installation, it has become necessary to prepare a program of the technology transfer for the plant operation. The modification of the management system of the project also aims at preparing the manpower for the plant operation. An annual master plan is shown in the attached table. Some important points of the plan are briefly explained below.

2. Program of the plant operation

The above plan was prepared on the basis of the proposed program of the steps and work plans for the plant operation. It also is summarized in the attached table. This program was arranged based on the following conditions.

1) A total of twelve engineers of CES (Centro Experimental del Sureste) are available for the plant operation. But one of them is expected to work as the chief of the maintenance team. Several engineers engaged in chemical analysis and mineral characterization are excluded from the operation teams.

2) A total of eight workers are available for the operation work.

3) The number of engineers necessary for the operation teams are 4 to 6 for the flotation work and 5 to 10 for the metallurgical work respectively. Therefore, all engineers excluding two chiefs are required to be engaged in both operations.

4) The number of Japanese experts were estimated focussing on the initiation steps for the flotation work and the productive steps for the metallurgical work respectively.

5) In view of the condition of water supply, it is reasonably considered that the rainy season is suitable for the flotation work. Also, the plant installation program indicates that the dry season can be allocated to the metallurgical one.

This program might be modified depending on the change of situation. However it should be enhanced that the work plans shown in the program are indispensable to transfer the technology necessary for the plant operation.

3. Dispatch of Japanese experts

(1) Change of long-term experts

Team Leader : The work of Dr. N. Fujii is to expire in the beginning of June, 1988. The change of leader is scheduled.

Metallurgist : Ing. H. Goto is scheduled to return back to Japan in the end of

July, 1988. A new expert is required to arrive at Oaxaca two weeks earlier than his departure.

Analytical chemist : Since the term of Ing. K. Tayama's service is to expire in next January, dispatch of his successor or the increase of his term is required.

(2) Request of short-term experts

Mineral processing engineer : It is very urgent to prepare the pyrite concentrate for the Kowa plant operation as soon as possible. One more expert is expected to guide the Mexican engineers supporting Dr. C. Izumikawa.

Instructor of the plant operation and maintenance : the metallurgical plant operation using furnaces and chemical plants is the first experience for almost all of the Mexican engineers. Kind and careful guidance is required to master the operation procedures and the maintenance work.

Metallurgist : Since the Kowa Process is composed of very diversified work, it is required that two metallurgists are dispatched to support the long-term expert in the early part of 1989.

Geologist : In order to test an applicability to Tec-Kowa process of various ores produced near Oaxaca, a systematic sampling by a geologist is recommended. The next dry season may be most suitable for such a work.

By the way, an expert assignment program for the next fiscal year should be discussed at the next Joint Committee.

4. Technology transfer

In the fields of mineral processing and metallurgy, most of the technology transfer will be done through the plant operation. Since the plant operation necessitates much more careful work than experiment, all the engineers concerned are required to master the theory and practical technology of the processes as soon as possible. In the field of chemical analysis also, the basic training for wet analysis is still now indispensable. Furthermore, training of the fluorescence analysis by the fusion method will start immediately. However, training for geological and mineralogical work will end with the expiration of the service of Dr. Fujii. Further training on the X-ray mineral identification will be done in Japan.

5. Training in Japan

Two chemical engineers are scheduled to be sent to Japan to get training on X-ray fluorescence analysis and X-ray mineral identification. Besides them, the project sincerely hopes two more engineers will be accepted for the training of the plant maintenance and operation within this fiscal year.

6. Equipment donation

The project deeply thanks to the JICA Headquarters for their valuable equipment donation. However, some additional equipments are necessitated for the plant operation and maintenance. Particularly, some materials for facility repair and some spare parts are indispensable. It is expected they will be donated as additional equipments.

(April 18, 1988)

PRELIMINARY SURVEY OF LEVEL NO.6, CAMPO MORADO MINE

By
Dr.Noriyuki Fujii and Ing.Antonio Aquino
The JICA-CFM Joint Project, Oaxaca
(June, 1987)

1. INTRODUCTION

The present JICA-CFM cooperation project aims at developing unutilized pyrite-rich polymetallic ores, which occur mainly in States of Guerrero and Michoacan, southern Mexico. The project has a plan to construct a mineral processing pilot plant including the chloridizing volatilization process at Oaxaca, and carry out transfer of the related technology through the plant operation using ores from the Campo Morado mine, Guererro,and others. Because the Campo Morado ores are of the so-called Kuroko-type that is used as the main raw material of the chloridizing volatilization process, namely TEC-KOWA Process.

Since April, 1987, the Altamirano Branch of CFM has begun to reconstruct an old drift, Level No.6,, of the mine in order to prepare the mining work. The writers carried out a preliminary underground survey due to a request of the above Branch. The survey involves five meters interval sampling near an old working spot of Crosscut No.2, but detailed observation was not completed because of shortage of time and lack of ventilation. The results of the preliminary investigation on the collected samples are briefly reported in the present paper.

The writers are greatly indebted to Ings. Romeo A. Cruz, J. Saúl Pérez and Ismael Flores of the Alatamirano Branch for their kind support extended to the present survey. Ing. Fernandez Jiménez of the Promotion Division gave a valuable information of his geological work at Campo Morado. Ing. Yasumasa Ito, CFM, and Ing. kazu Iwano, Japanese expert, also joined the writers to support their work. Very rapid and precise chemical analysis was carried out on the collected samples by Ings. Alejandro Nicolas, Juana Sanchez and Josefina Oceguera of the CFM Southeast Center under Ing. Kichimi Serita's instruction. Ing. Yolanda Balderas of the same Center kindly identified the mineral composition of the samples with X-ray powder diffraction method.

The writers sincerely thank them for their kind help.

2. LOCATION AND ACCESSIBILITY

The Campo Morado mine is situated approximately lat.18°13'N and long. 100°6'W. It is located near the main settlement of Campo Morado, about 40 kilometers southwest of Teloloapan in the northern part of the State of Guerrero. About 38 kilometers unpaved and winding road leads to Campo Morado, branching from the Iguala-Teloloapan-Altamirano highway at the village of Aguacate. The first 20 kilometers between Aguacate and Ixcatepec are wide enough for traffic of a big truck, but the latter 18 kilometers from Ixcatepec to Campo Morado are so narrow and rugged that only a small truck can pass through with difficulty. It takes about two hours by car from Aguacate to Campo Morado. The Campo Morado area is 1000 to 1500 meters high above sealevel and steeply rising (Fig.1).

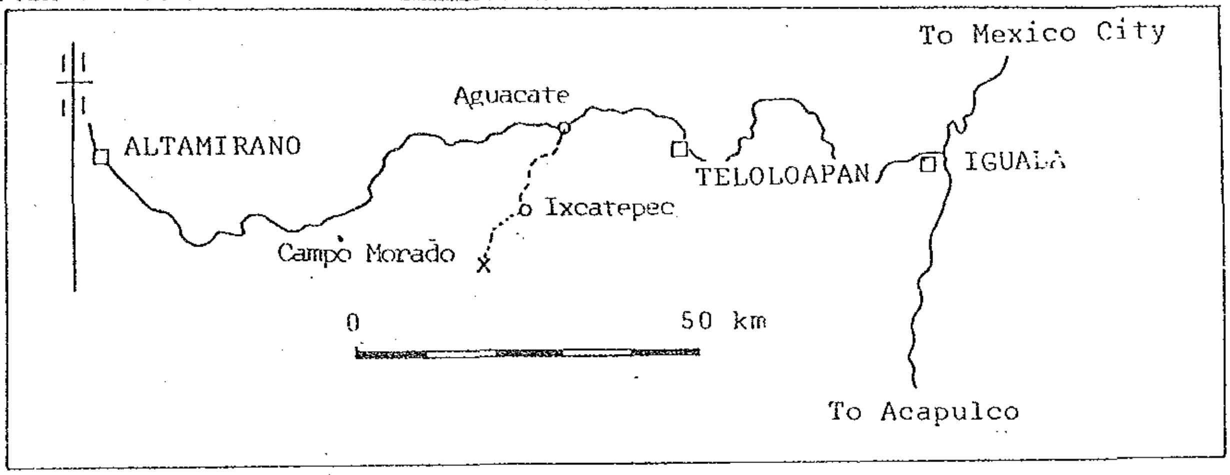

Fig. 1 Map Showing the Location

3. PAST EXPLORATION WORK

According to Lorinczi and Miranda (1978), there were three major periods of production from the Campo Morado mine between the late 1880s, the time of discovery, and 1939. In 1903, a smelter was constructed at Reforma, the largest known orebody at Campo Morado.

In 1973, a consortium of Mexican and American interests initiated an exploration program of the sulfide portions of the four medium-sized deposits in the Campo Morado area. The exploration work involved reopening and advancing of 3.7 kilometers of drifts and crosscuts and 840 meters of underground diamond drilling, which were executed during the period from 1973 to 1977. However, the exploitation program was interupted in 1980. It is presumed this mainly depended on an unsatisfying results of the mineral processing test.

In 1980, a JICA mission headed by Ing. Tatsuo Konada carried out a feasibility study on sulfide ore deposits in the State of Guerrero due to a request of Consejo de Recursos Minerales (CRM). This study involves a geological field survey of the Campo Morado deposits. The mission concluded that the chloridizing volatilization process may be applicable for development of the Campo Morado ores (JICA, 1981).

Furthermore, CRM carried out an areal reconnaissance in the Campo Morado-Achotla area. The results were reported by Zamorano and Martinez (1986).

A brief summary on the geology and ore deposits at Campo Morado is given below according to these works.

The Campo Morado area is mainly underlain by limy shales/slates with greywacke intercalation and rhyolitic to dacitic pyroclastics, probably of lower Cretaceous, and andesitic and granitic intrusives. The Cretaceous sediments generally trend N20-45°W and gently dip to west to southwest. Major faults are concentrated near Campo Morado, particularly the western end of the Reforma ore body.

The Reforma ore body, the largest one, is enclosed in volcano-sedimentary sequence, and shows bedded and lenticular shape. It trends N40-70°W in general and dips 25 to 70° to southwest. The size of the ore body was estimated about 500 meters in strike direction, 20 to 50 meters thick and more than 80 meters in depth by Lorinczi and Miranda (1978). The sulfide ores from Reforma are very fine-grained and compact. The major ore minerals are pyrite, sphalerite, chalcopyrite and galena, and tetrahedrite, arsenopyrite, marcasite and pyrrhotite are common accessaries. According to the same authors, the exploration at Reforma delineated eight million tons of massive pyrite sulfides grading at 3.12 % Zn, 1.07 % Pb, 0.68 % Cu, 111.8 g/t Ag and 1.2 g/t Au in average.

4. PROGRESS AND RESULTS OF THE PRESENT WORK

4-1. Sampling

At Reforma, there are five levels drift from No.2 to No.6 as shown in Fig.2. Among them, only Level No.5 and No.6 could be surveyed by the JICA mission and the CRM team, although both two had collapsed in places. Since the present

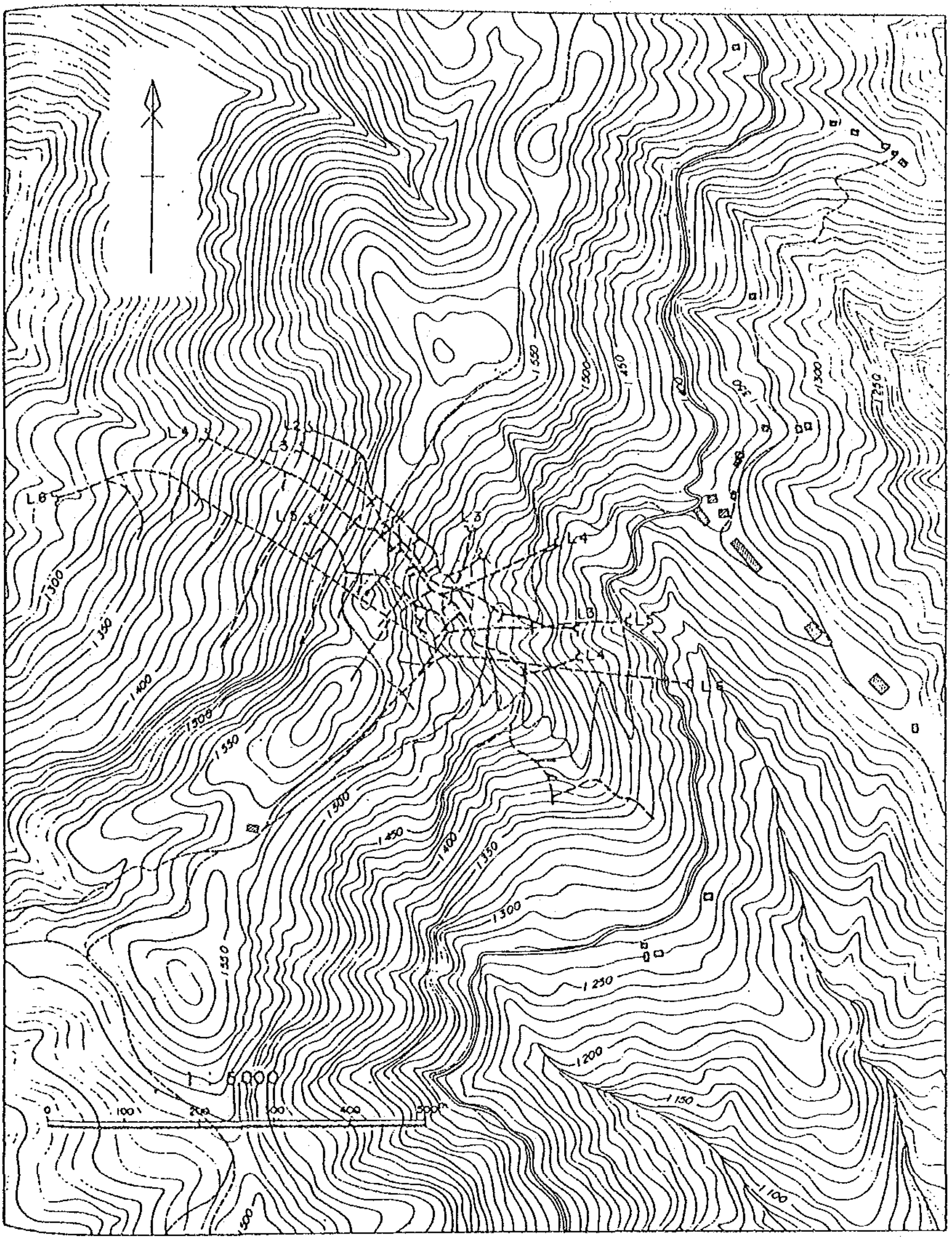

Fig. 2 Topographic map of Campo Morado (Reforma)

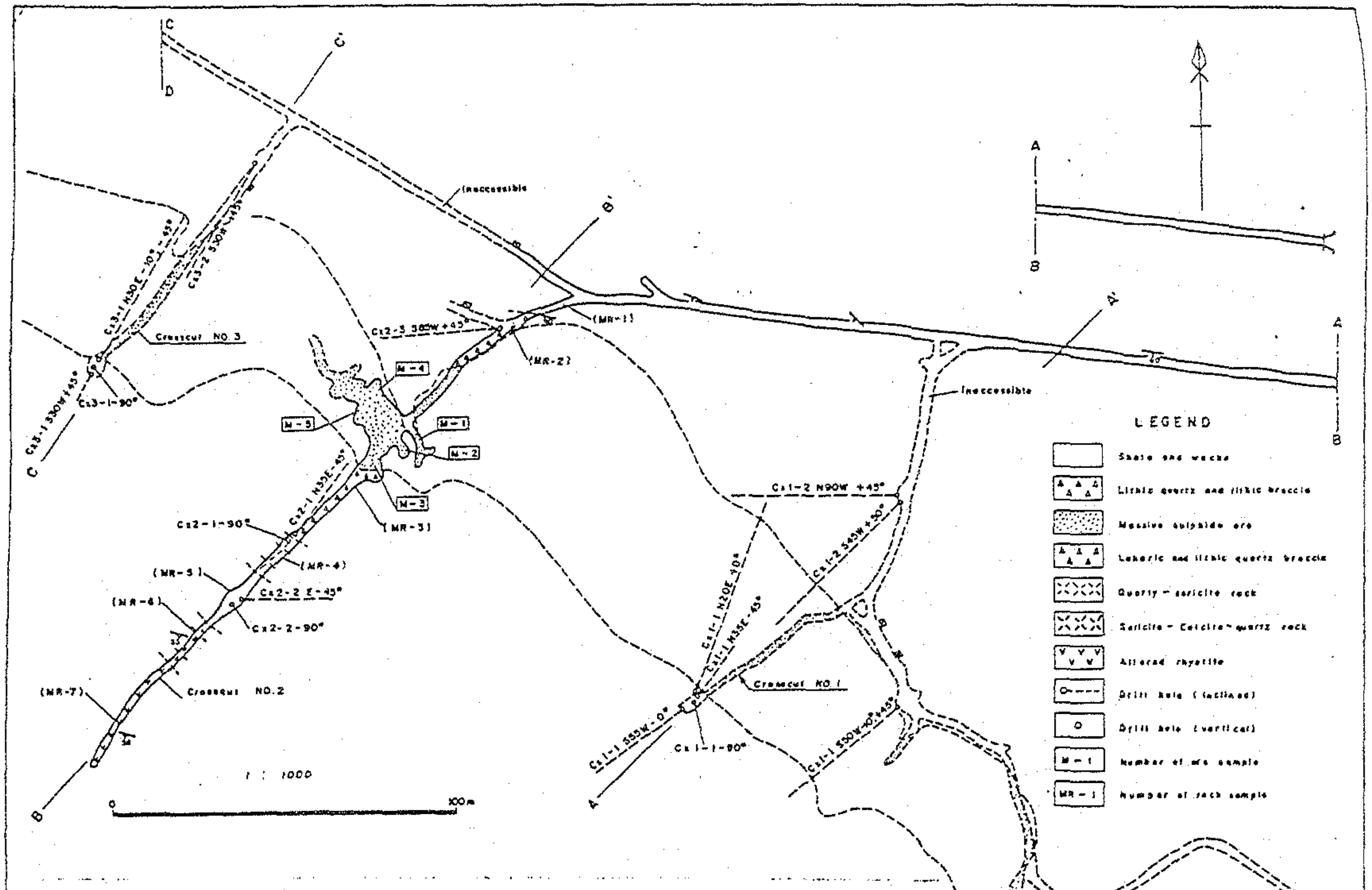

Fig. 3 Geological Map of Drift Level 6, Campo Morado (After LORINCZI et al.)

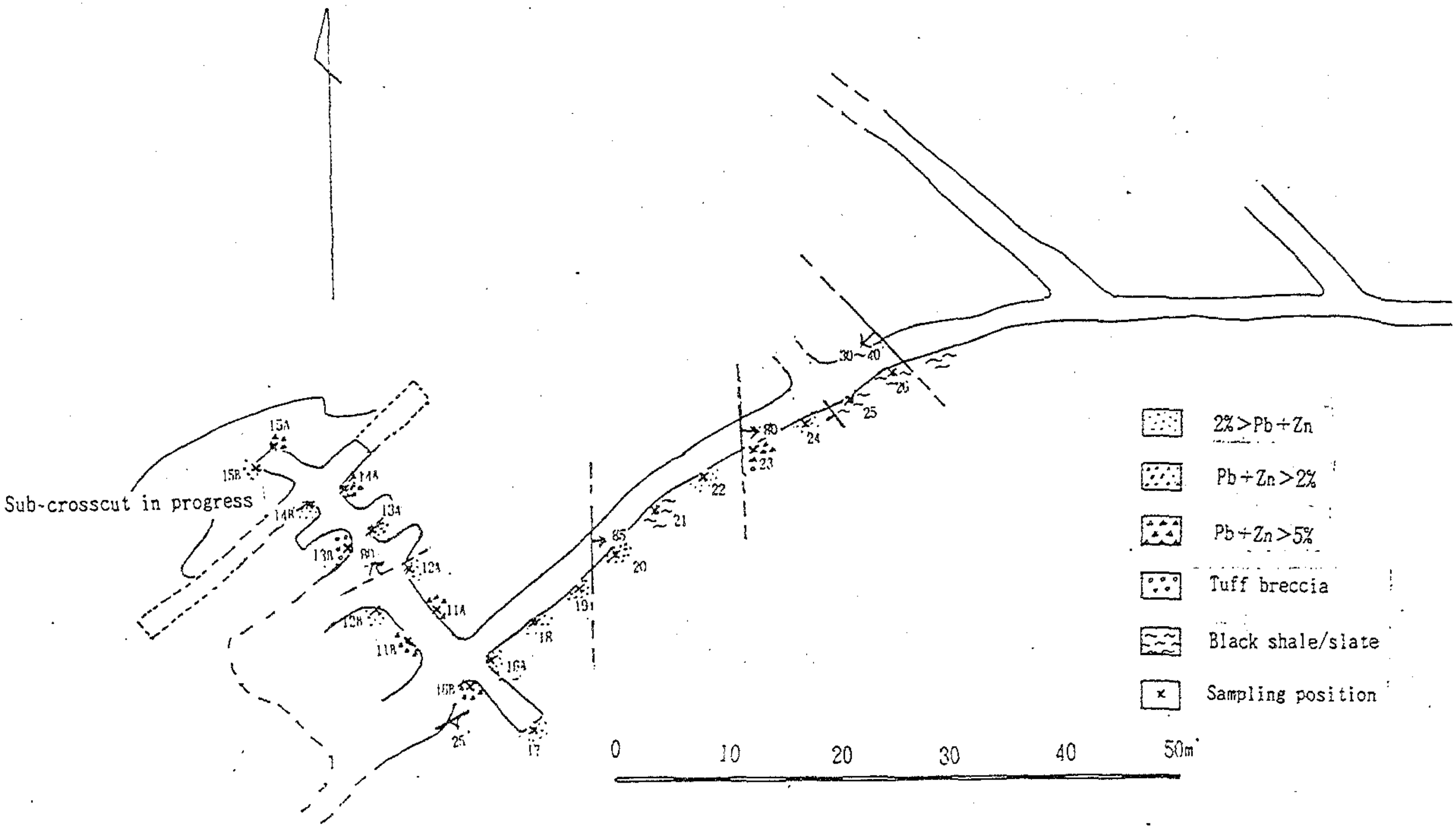

Fig. 4 MAP SHOWING SAMPLING LOCALITIES AT LEVEL No.6. CAMPO MORADO MINE

project has a plan to mine crude ores from Level No.6 that is comparatively well preserved, the work for drift reconstruction is being carried out at the same Level. Fig.3 shows the ore body occurs through Crosscuts Nos.1, 2 and 3 of Level No.6. The present sampling was done around the old mining spot of Crosscut No.2. A total of twenty-two grab samples were collected with a 5 meters interval as shown in Fig.4.

Most of the collected ores are very fine- to fine-grained and compact, and show dark to whitish yellow colour in general. They are rather homogeneously massive, and some ores are characterized by sulfide aggregate spots. Banded structure consisting of black part and yellow one is observed in places, although this is not so common. A number of faults are found near the same spot, and the ore body shows very complicated occurrence being influenced by the faulting.

The collected samples were broken into small pieces, and their surface parts were excluded as possible. All of the ore samples were crushed and ground, and then supplied for chemical analysis and X-ray diffraction study.

4-2. Mineral composition

The mineral composition was roughly identified with X-ray powder diffraction for all of the ore samples. The results are summarized in Table 1, and some typical powder patterns are illustrated in Fig.5. The standard powder data of main sulfides are shown in Table 2.

It is very noticiable that some reflections of these sulfides are very similar in d-values with an exception of chalcopyrite. For example, the reflections of sphalerite perfectly accord to those of pyrite, and an only diagnostic parameter is difference in peak intensity. The intensity ratio between 3.13 Å and 1.633 Å peaks of pyrite and sphalerite are 35/100 and 100/30 respectively. The approximate content of sphalerite may be estimated based on the above ratios. The intensity ratio between 2.71 Å and 1.91 Å peaks may be an useful indicator to distinguish marcasite from pyrite as well. For example, a 3.13 Å peak of CP-11A in Fig.5 is abnormally strong comparing to 1.635 Å peak as shown. This indicates CP-11A contains a considerable amount of sphalerite. Also, a 2.715 Å reflection of CP-12B is little higher than 1.635 Å one. It is presumed this sample may contain a small amount of marcasite.

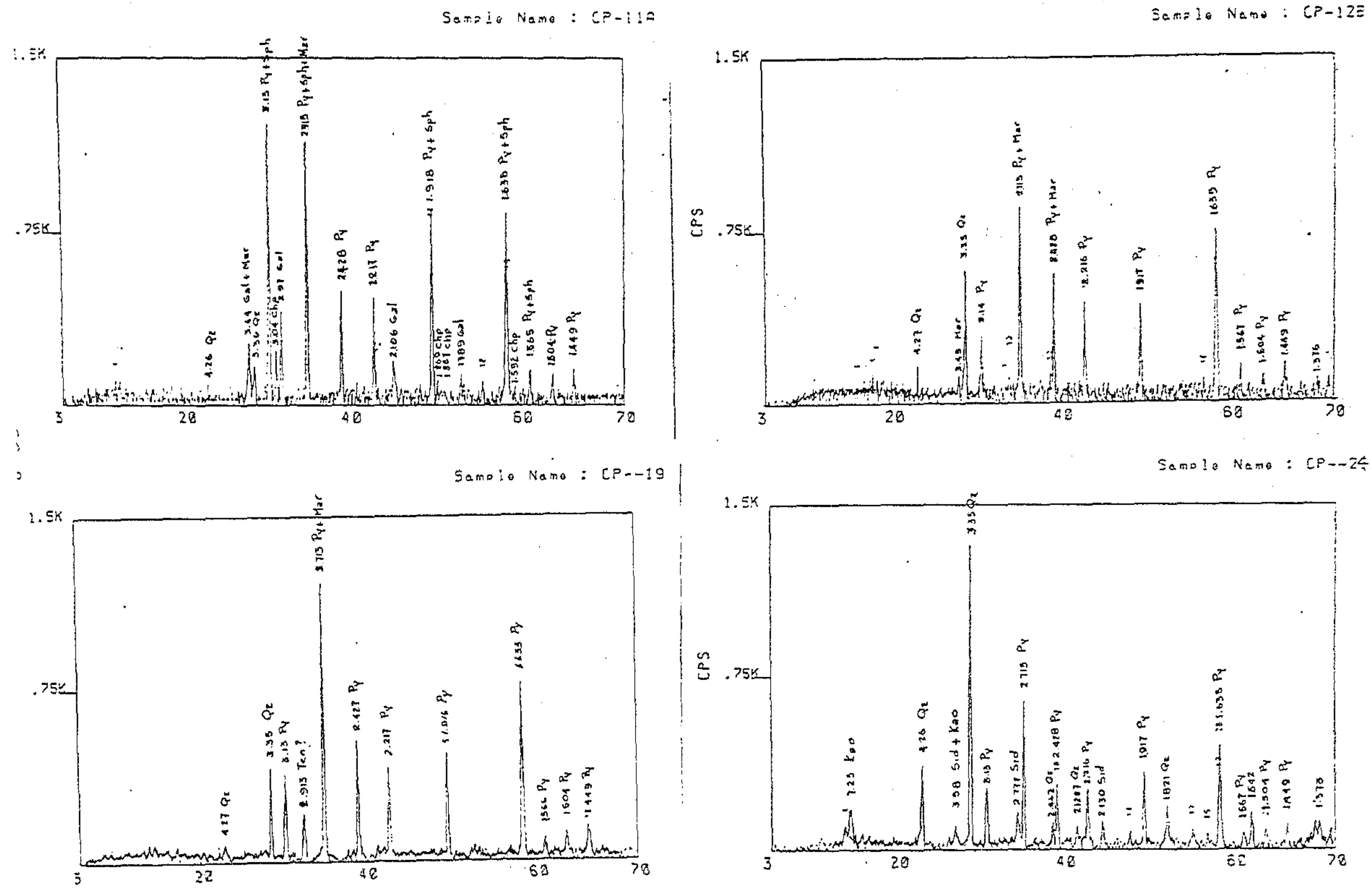

Fig.5 Typical Powder Patterns of the Campo Morado Ores

Table 1. Mineral Composition of the Collected Samples, estimated by X-ray

No.	Pyrite	Sphar.	Galena	Chalc.p.	Marcas.	Quartz	Others
11-A	◎	○	△	×～△	×～△	×	Fel.
11-B	○		×		△	×	Gib.?
12-A	○				△	×～△	Fel. Gib.?
12-B	◎				△	△～○	
13-A	○	×			×?	△	2.345 A
13-B	△	×?			×	●	kao.
14-A	◎	△～○		×?		△	Tet.?
14-B	○			×	△～○	×～△	
15-A	○	×～△	×		△	×	
15-B	△	×?			×		
16-A	◎				×	△	
16-B	◎	△	×～△	×?	△	△	
17	◎	×?			△～○		Bar.,4.79 A.
18	◎	×?		×	×?	○	kao. Chl.?
19	◎	×			×	△	Ten.,2.850 A
20	◎	×	×?	×	×～△	△	Fel.
21	△				×	◎	kao.Chl.Amph.
22	◎			×	×	×	
23	◎	△			×	×	Ten.?
24	○	×			×?	○	kao.Chl.? Sid.

Note

● : very dominant
◎ : dominant
○ : medium
△ : little
× : very little

Fel.: Feldspar
Gib.: Gibbsite
Kao.: Kaolinite
Tet.: Tetrahedrite
Bar.: Barite

Ten.: Tennantite
Chl.: Chlorite
Amph: Amphibole
Sid.: Siderite

Table 1 indicates that the mineral composition is considerablly different from sample to sample. In general, they consist mostly of pyrite and are accompanied by sphalerite, quartz and secondary marcasite. Galena and chalcopyrite are minor accessaries. Besides, feldspar tennantite, barite, kaolinite, siderite and some unidentified minerals were detected by X-ray diffraction.

By the way, a country rock sample, CP-13B, is composed mostly of quartz accompanied by kaolinite, pyrite and sphalerite, and another one, shale (CP-21), consists mainly of quartz and kaolinite, accompanied by amphibole, pyrite and clay minerals such as chlorite.

Table 2. X-ray Powder Data of Main Sulfides (after ASTM)

Pyrite		Marcasite		Sphalerite		Galena		Chalcopyrite	
d A	I/Io	d A	I/Io	d A	I/Io	d A	I/Io	d A	I/Io
		3.44	40			3.429	84		
3.128	35			3.123	100			3.03	100
						2.969	100		
2.709	85	2.71	100	2.705	10			2.63	5
2.423	65	2.41	25						
2.2118	50	2.32	25						
		2.05	5			2.099	57		
1.9155	40	1.91	30	1.912	51			1.865	40
		1.76	63			1.790	35	1.854	80
		1.69	15			1.714	16		
1.6332	100	1.67	10	1.633	30			1.591	60
1.564	14	1.59	20	1.561	2			1.573	20

4-3. Chemical analysis of the collected ores

All of the collected ore samples were analyzed for Fe, Cu, Pb, Zn, Ag and As mainly by Atomic Absorption and partly by titration. The results are summarized in Table 3.

It is very noticeable that they are remarkablly different in metal grade with each other. Some ores are of typical Kuroko-type, and others are predominated by pyrite. Since the ratio of Pb to Zn is rather variable, they were more or less influenced by oxidation and leaching. The common occurrence of marcasite indicates the above effects. Also, it would be notworthy that Ag-grade is rather high in general, and seems to be well correlated with Pb.

According to the metal grade, the collected ores might be classified into the following three; over 5 % in Pb+Zn (Kuroko type), 2-5 % in Pb+Zn (Intermediate) and under 2 % in Pb+Zn (Pyrite ore). This classification was marked at each sampling locality as shown in Fig. 4.

In view of such a conspicuous change of metal-grade in the ore body, more careful and detailed observation is necessitated to get a reasonable interpretation on the mode of occurrence of ore body.

Table 3. CHEMICAL ANALYSIS OF THE CAMPO MORADO ORES

No.	Fe(%)	Cu(%)	Pb(%)	Zn(%)	Ag(g/t)	As(%)
CP-11A	30.68	1.90	5.98	10.70	478	0.70
CP-11B	37.55	0.25	4.60	1.39	660	0.23
CP-12A	40.40	0.12	0.38	0.22	87	0.05
CP-12B	37.63	0.14	0.24	0.45	74	0.07
CP-13A	40.84	0.50	0.53	3.67	83	0.10
CP-14A	38.17	0.38	2.50	8.08	124	0.11
CP-14B	40.77	0.13	0.95	0.38	98	0.08
CP-15A	37.43	0.38	2.90	6.53	124	0.14
CP-15B	42.80	0.25	0.46	2.40	109	0.01
CP-16A	37.08	0.08	0.20	0.26	158	0.25
CP-16B	35.04	0.80	3.65	6.08	404	0.52
CP-17	42.40	0.21	0.20	1.42	64	0.08
CP-18	31.71	1.00	0.90	1.06	178	0.23
CP-19	38.70	0.32	0.53	2.40	81	0.51
CP-20	36.71	0.72	0.71	3.68	148	0.19
CP-22	42.60	0.17	1.08	0.34	232	0.19
CP-23	35.96	0.22	0.42	5.40	89	0.25
CP-24	21.82	0.31	0.52	1.19	114	0.15

Analysis: A. Nicolás, J. sánchez, J. Oceguera

5. THE PRESENT PROBLEMS

The pilot plant being constructed at the Southeast Center aims to investigate various conditions suitable for processing pyrite-rich sulfide ores. Particularly, processing of the Kuroko-type ore is one of the important purposes. In addition, pyrite ore is necessitated to get an adequate composition of cinder pellet for TEC-KOWA Process. The results of chemical analysis indicate the Campo Morado deposit may supply both type ores, Kuroko and pyrite ores. Therefore, it is required to determine the parts capable of providing each type ore. The writers already recommended to advance two sub-crosscuts in order to make the detailed survey more effective. They are illustrated in Fig. 4.

It is expected the next detailed survey will suggest some suitable parts for mining of both Kuroko and pyrite ores.

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PROGRESS REPORT OF THE DETAILED SURVEY AT CAMPO MORADO MINE

By

Dr. Noriyuki Fujii and Ing. Antonio Aquino

1. Progress of the work at Campo Morado mine

Based on our recommendation (Fujii & Aquino, June,1987), the CFM Altamirano Branch began to tunnel two crosscuts at Pit No.2 of Level No.6, Campo Morado mine, and completed them at the beginning of August. In July, Ing. Iwano and others carried out a preliminary sampling at the progressing crosscuts. Then, a detailed survey was done by the writers at 27th and 28th of August. The newly excavated crosscuts and the whole sampling localities are shown in Fig.1. Length of the new crosscuts are 17 m for the right one and 6.5 m for the left one respectively. Most of the collected samples were investigated by chemical analysis and X-ray diffraction. Also, some of them were studied under microscope by Ing. M. Monroy. The results of the field investigation is briefly summarized in this paper. The chemical and X-ray investigation and the microscopic study are to be introduced in detail by Ings. Aquino and Monroy respectively.

2. Mode of occurrence of the Campo Morado deposit

There occur over 12 meters thick massive sulfide orebody at Pit No.2, Level No.6. It is underlain by black shale/slate, slaty sandstone and/or acid tuff breccia. The orebody shows stratiform and gentle undulation. But it generally dips 10 to 30 ° to the south. The orebody is composed of dissemination zone, kuroko zone with disseminated intercalations and pyrite zone in ascending order. The kuroko zone with intercalation is around 10 meters thick and the pyrite zone is over 2 meters at least. The orebody irregularly undulates and is influenced by small faults. Its complicated and variable occurrence depends on such a structural feature.

However, it should be noted that the kuroko zone occurs at middle to lower part of the orebody, and the pyrite zone at the uppermost part. This suggests both kuroko and pyrite ores can be mined separately at Campo Morado. The kuroko is extremely fine-grained, and the pyrite ore is coarser-grained. The results of chemical and X-ray study show the kuroko consists mainly of pyrite, sphalerite and galena, and contains a small amount of chalcopyrite in places. A variable amount of quartz also was found particularly in dissemination ores.

The kuroko contains 3.16 to 16.60 % Zn, 0.55 to 6.50 % Pb, 0.34 to 1.88 % Cu and 80 to 884 g/t Ag. In addition, over 10 g/t Au was found in a few samples. On the other hand, the pyrite ore contains more than 40 % Fe, and 0.88 to 2.67 % in total of Cu, Pb and Zn. The pyrite content is estimated 87 to 93 %.

(Oct. 20, 1987)

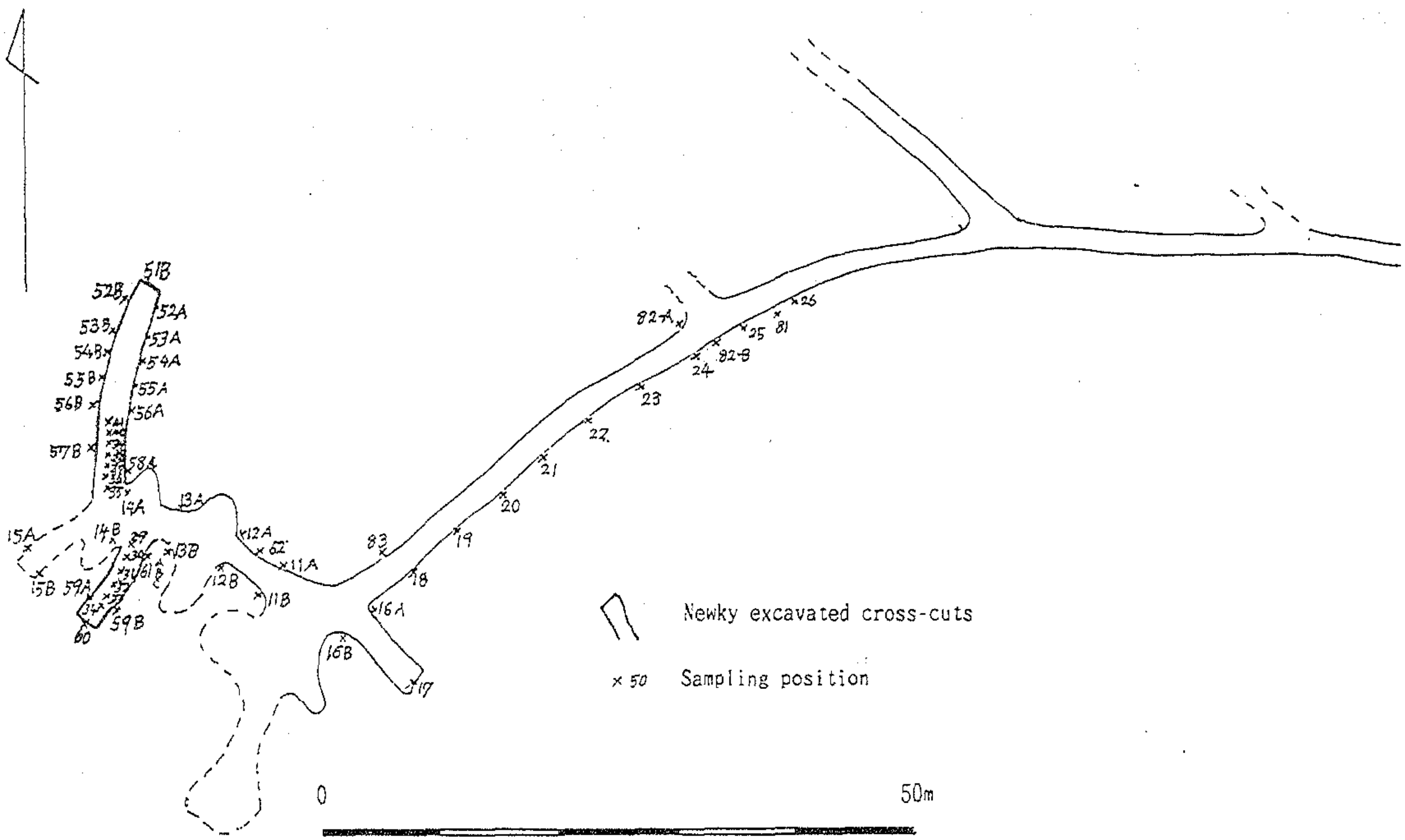


FIG.1 MAP SHOWING SAMPLING LOCALITIES AT LEVEL NO.6, CAMPO MORADO MINE

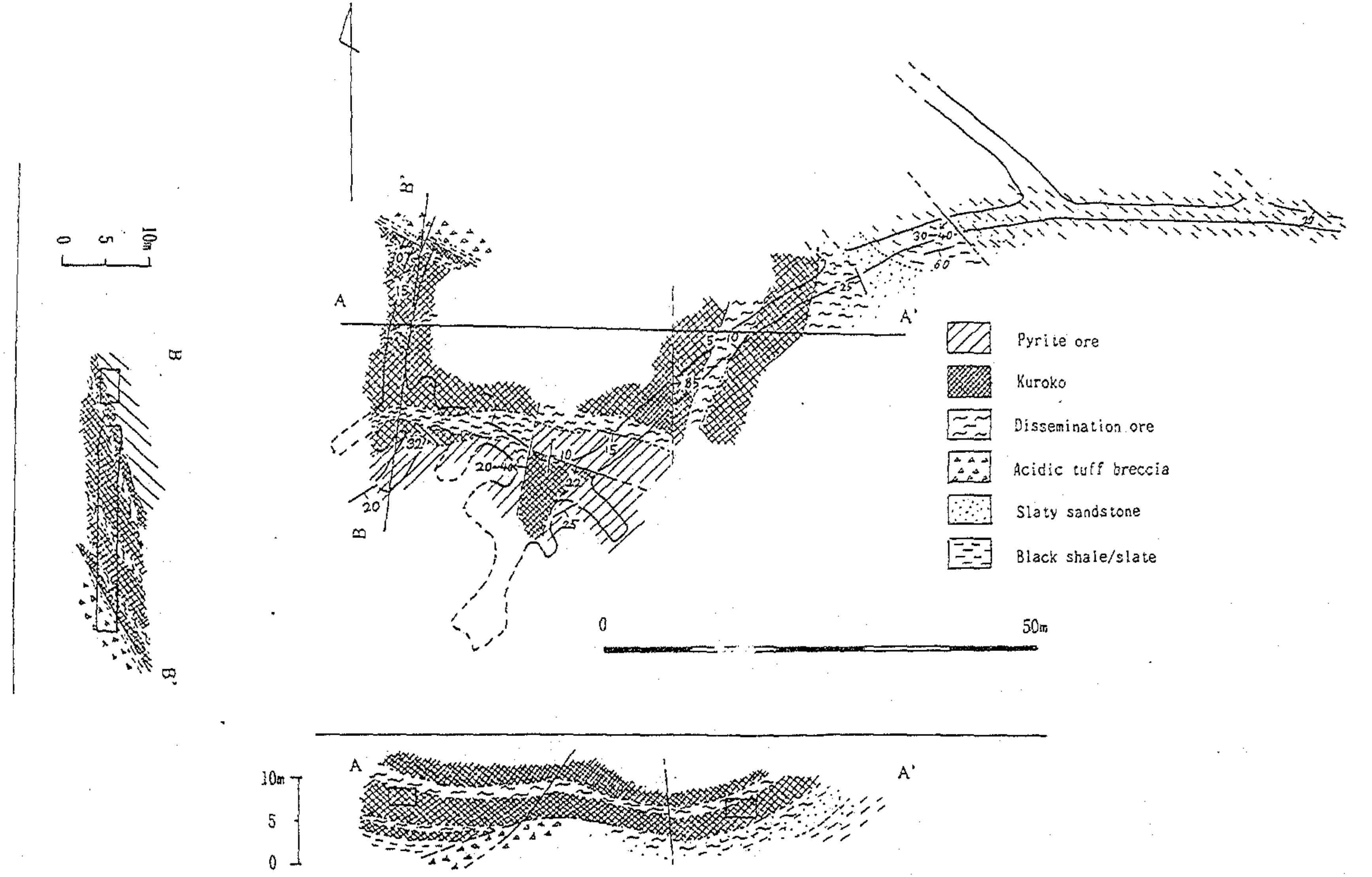


Fig.2 GEOLOGICAL MAP AT THE CROSS-CUT NO.2, LEVEL NO.6 OF CAMPO MORADO MINE

Geological survey : N.Fujii and A. Aquino (Aug., 1987)

MICROSCOPIC DESCRIPTION OF THE MINERALOGY OF THE MASSIVE SULFIDE DEPOSIT OF CAMPO MORADO, GUERRERO

ING. MARCOS GUSTAVO MONROY FEDZ.

ABSTRACT

The sulfide bodies of the Massive Sulfide Deposits of Campo Morado, Guerrero consist of Pyrite, Sphalerite, Chalcopyrite, Galena, Tetrahedrite-Freibergite, Marcasite and Bornite in decreasing order of abundance.

According to the Pb + Zn grade, the Campo Morado ore is classified into three class for Jujii, N, and Aquino, A. (1987). Nevertheless distinct textures of each ore class have been identified, the main characteristics of the ore are the very fine particle size and the very fine intergrowts between sulfides. These characteristics have an negative affect on the liberation size of the different metals.

Three distinct textures of the Pyryte ore type (Pb + Zn < 2%) have been identified-depending on the type of Pyrite encountered: (1) smooth surface pyrite with euhedral to anhedral forms. The grain size of the pyrite varies between 2 and 300 microns. Chalcopyrite, Sphalerite, Galena and Tetrahedrite are the interspace-fillers in the Pyrite. The grain size of the sulfides ranges between 1 and 250 microns, but the mean size varies from 5 to 10 microns. (2) colloidal type with – colloform pyrite. Chalcopyrite es intimately intergrown with the colloform pyrite. Furthermore, Galena and chalcopyrite may remplace colloform pyrite. The grain size of this pyrite type is indeterminate because many chalcopyrite and galena intergrown with this colloform pyrite. (3) sulfide-bearing breccias type.

It appears that the brecciation is an product of the faulting and fracturing of the smooth surface pyrite type. The clast in this breccia are pyrite fragments with Chalcopyrite, Sphalerite and galena intergrown. While the cement is quartz with minor iron oxides. These three types of Pyrite textures are intimately intergrown with each other.

Three distinct textures of the Kuroko ore type (Pb + Zn > 5%) have been also identified, but in this case depending on the sulfide spatial distribution: (1) banded Kuroko ore type, wich is the product of the chalcopyrite, gelena and sphalerite rhithmic banding. The three types of bands have many inclusions of euhedral pyrite. The grain size of this pyrite ranges between 1 and 500 microns, but mean size is 25 microns. (2) disseminated Kuroko ore type. The disseminated sulfides in the gangue have been identified in colloidal textures and filling cracks and gaps textures, here, the sphalerite shows the larger particle size of all the base metal sulfides (between 5 microns and 2mm) but some of this sphalerite contains fine-exsolution blebs of chalcopyrite. The other sulfides have an mean particle size between 30 and 50 microns. (3) Pyrite-bearing Kuroko ore type wich the textures are the same as the Pyrite ore type.

In opposition to description of Lorinczi, G. I. and Miranda, V. J. C. (1978), the ocurrence of the metal precious has been found homogeneous. Electrum occurs intergrown with freibergite *(silver-bearing tetrahedrite) in some areas fills the interspaces in the pyrite. The grain size of* the electrum varies from 1 to 15microns. Most of the silver is present in the freibergite, wich in turn is mainly intergrown with galena in all those identified textures. Inclusions of argentite have been identified in pyrite of the pyrite ore type.

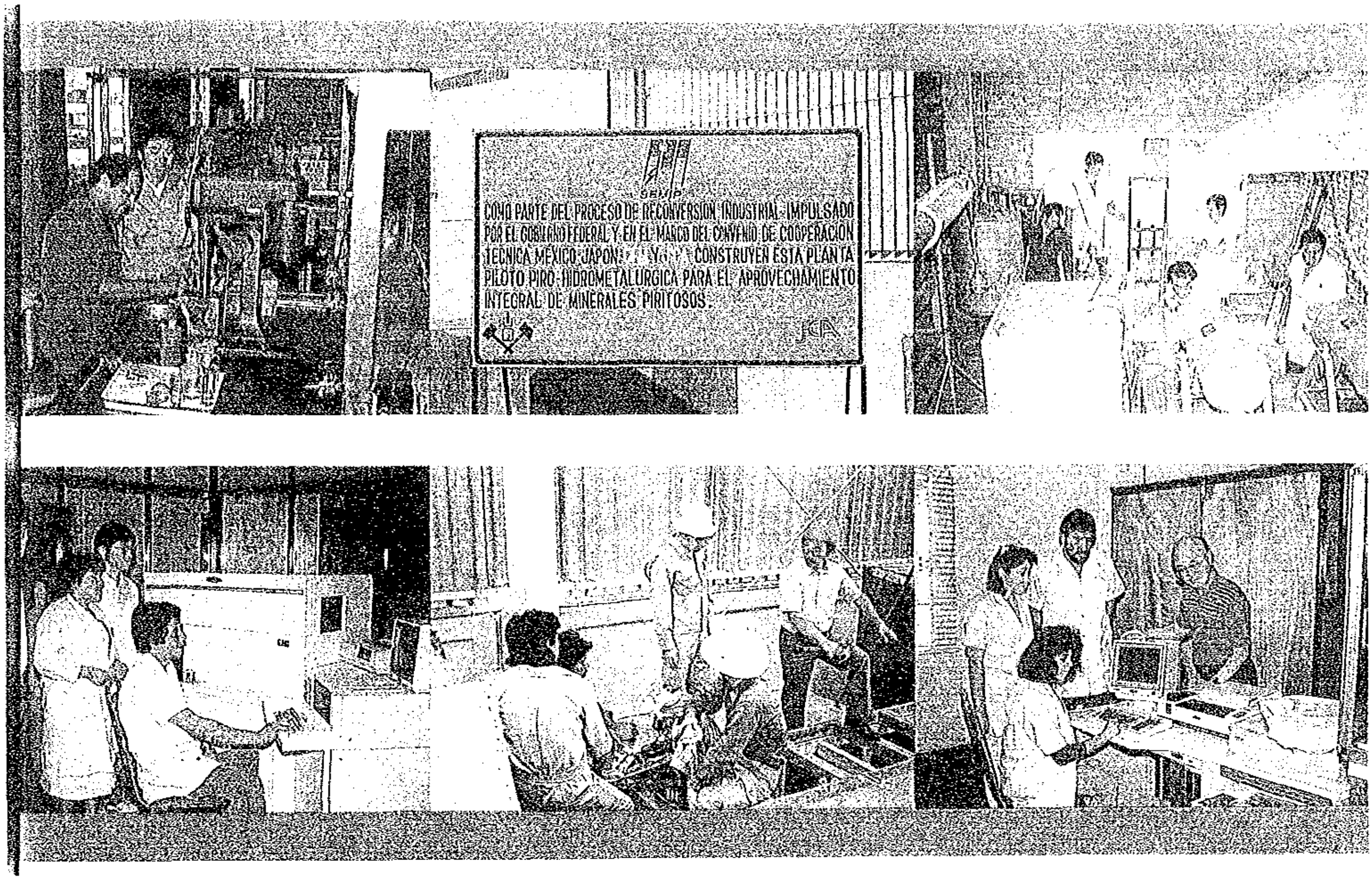
The metal precious liberation size has a diameter of about 20 microns.

	PYRITE ORE			KUROKO ORE		
	SMOOTH SURFACE TYPE	COLLOIDAL TYPE	SULFIDE-BEARING BRECCIAS TYPE	BANDED TYPE	DISSEMINATED TYPE	PIRITE-BEARING KUROKO TYPE
PYRITE	FINE AND COARSE GRAINED	COLLOFORM	COLLOFORM AND FINE AND COARSE GRAINED	EUHEDRAL INCLUSIONS INTO THE RHITHMIC BAND.	COLLOFORM AND DISSEMINATED GRAINS	FINE AND COARSE GRAINED, AND COLLOFORM
	2 TO 300 µm (23µm)	indeterminate size	<1 TO 350 µm (20µ)	1 TO 500µm (25 µm)	1 TO 100µm	2 TO 350 µm (25µm)
SPHALERITE	INTERSPACE-FILLER	PATCHES	INTERSPACE-FILLER AND CIMENT	BANDING	DISSEMINATED PATCHES	INTERSPACE-FILLER AND PATCHES
	2 TO 250 µm (10 µm)	<1 TO 150µm (?)	15 TO 200 µm (23µm)	indeterminate size	2 µm TO 2mm	2 TO 250 µm (15µm)
GALENA	INTERSPACE-FILLER	COLLOFORM	INTERSPACE-FILLER	BANDING	COLLOFORM AND DISSEMINATED PATCHES	INTERSPACE-FILLER AND COLLOFORM
	2 TO 60 µm (15 µm)	indeterminate size	2 TO 55 µm (15 µm)	indeterminate size	5 µm TO 1,5 mm	2 TO 60µm (15µm)
CHALCOPYRITE	INTERSPACE-FILLER	COLLOFORM TO IRREGULAR	INTERSPACE-FILLER AND REPLACEMENT	BANDING INTERGROW WITH GALENA	EXSOLUTION BLEBS IN SPHALERITE	INTERSPACE-FILLER AND COLLOFORM
	2 TO 100µm (20µm)	indeterminate size	2 TO 100µm (20µm)	5 TO 300µm (30µm)	<1 TO 10 µm. (4µm)	1 TO 90 µm (30µm)
TETRAHEDRITE -FREIBERGITE	INTERSPACE-FILLER SMALL PATCHES	SMALL PATCHES	SMALL PATCHES	SMALL PATCHES 2 TO 160 µm (30µm)	SMALL PATCHES	INTERSPACE-FILLER AND COLLOFORM
	1 TO 60µm (6µm)	1 TO 80 µm (10 µm)	<1 TO 25µm (?)	<1 TO 30 µm (12µm)	<1 TO 30µm (8µm)	<1 TO 30µm (6µm)
ELECTRUM	?	?	?	?	?	?
	TRACES INTERGROWN WITH FREIBERGITE	TRACES INTERGROWN WITH FREIBERGITE	?	?	?	TRACES INTERGROWN WITH FREIBERGITE
	1 TO 15 µm (?)	1 TO 17 µm (?)	?	?	?	1 TO 15 µm (?)
ARGENTITE	?	?	?	?	?	?
	TRACES INTO PYRITE	TRACES INTO PYRITE	?	?	?	TRACES INTO PYRITE
	1 TO 18 µm (?)	1 TO 15 µm (?)	?	?	?	1 TO 18 µm (?)

.DIAGRAM SHOWING THE DOMINANT ORE MINERALS IN EACH ORE-
.TYPE OF THE MASSIVE. SULFIDE DEPOSITS OF CAMPO MORADO, GUERRERO.
(by Marcos G. Monroy Fedz., 1987).

PROYECTO

PARA LA RECUPERACION DE MINERALES VALIOSOS A PARTIR DE MINERALES POLIMETALICOS RICOS EN PIRITAS NO APROVECHADOS EN LOS ESTADOS UNIDOS MEXICANOS



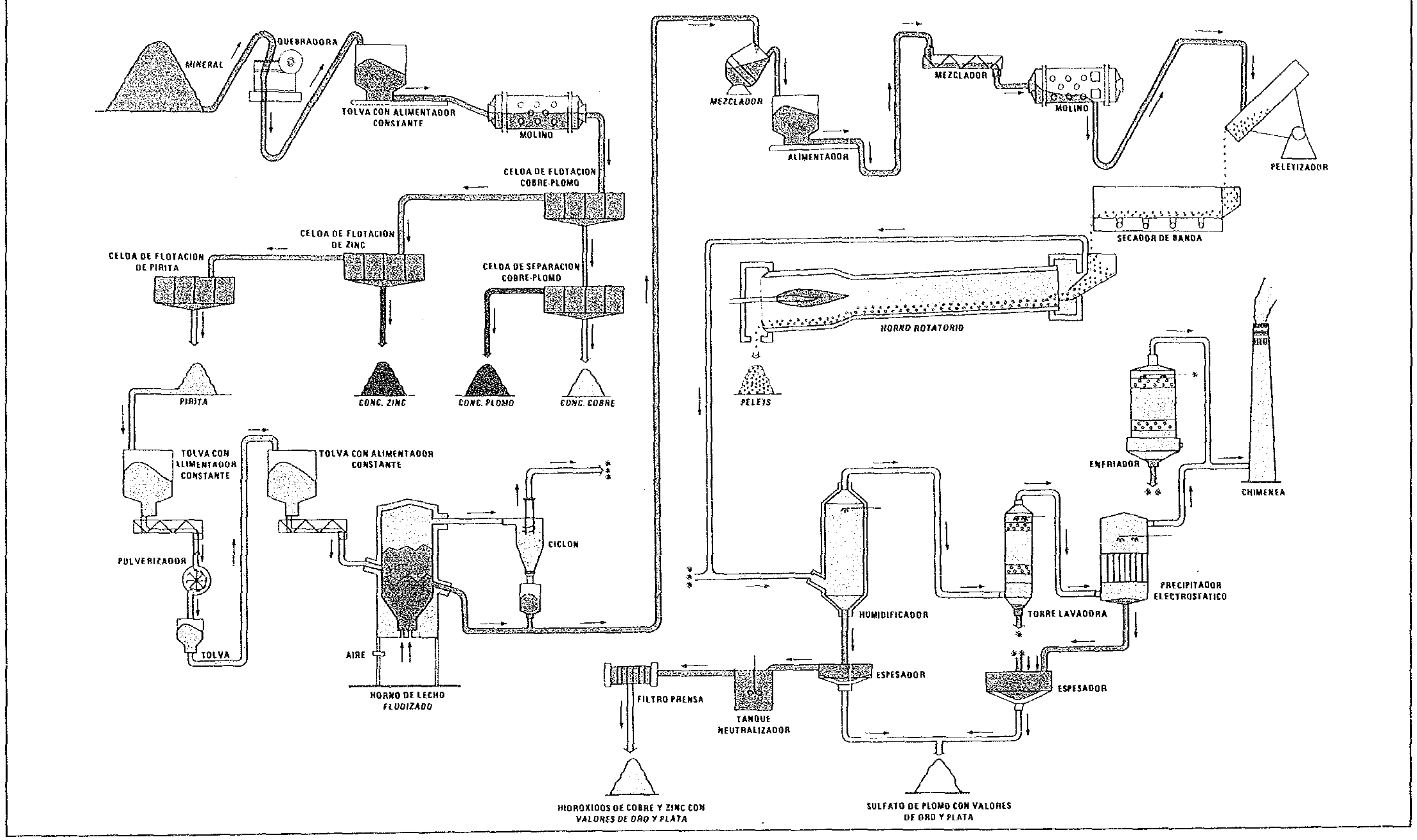
Comisión de Fomento Minero
Secretaría de Energía, Minas e Industria Paraestatal

Japan International
Cooperation Agency

プロジェクト広報パンフレット

DIAGRAMA DE FLUJO DE LA PLANTA PILOTO PARA EL APROVECHAMIENTO DE MINERALES POLIMETALICOS RICOS EN PIRITAS

(CFM, CENTRO EXPERIMENTAL DEL SURESTE)



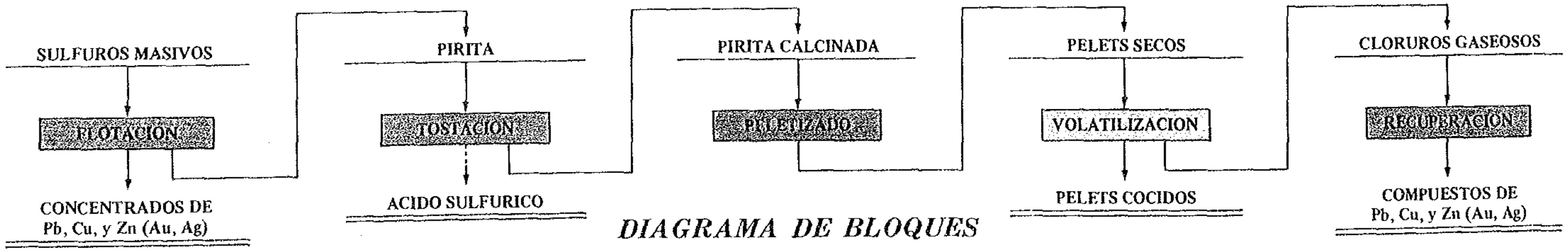
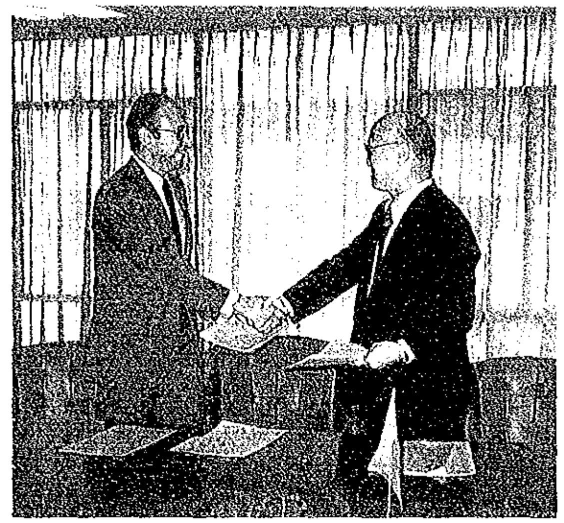


DIAGRAMA DE BLOQUES



Firma para el Proyecto (Febrero 18, 1986)
Lic. Luis de Pablo y Dr. Noriyuki Fujii

El Proyecto para la Recuperación de Minerales Valiosos *a partir de Minerales Polimetálicos Ricos* en Piritas no Aprovechados en los Estados Unidos Mexicanos, *tiene una duración de 4 años y com*prende las siguientes fases por parte de Japón:

Asignación de expertos japoneses.

Entrenamiento de personal mexicano en Japón.

Donación de equipo para laboratorio y planta piloto.

Capacitación en México del personal asignado por parte de México.

y por parte de México:

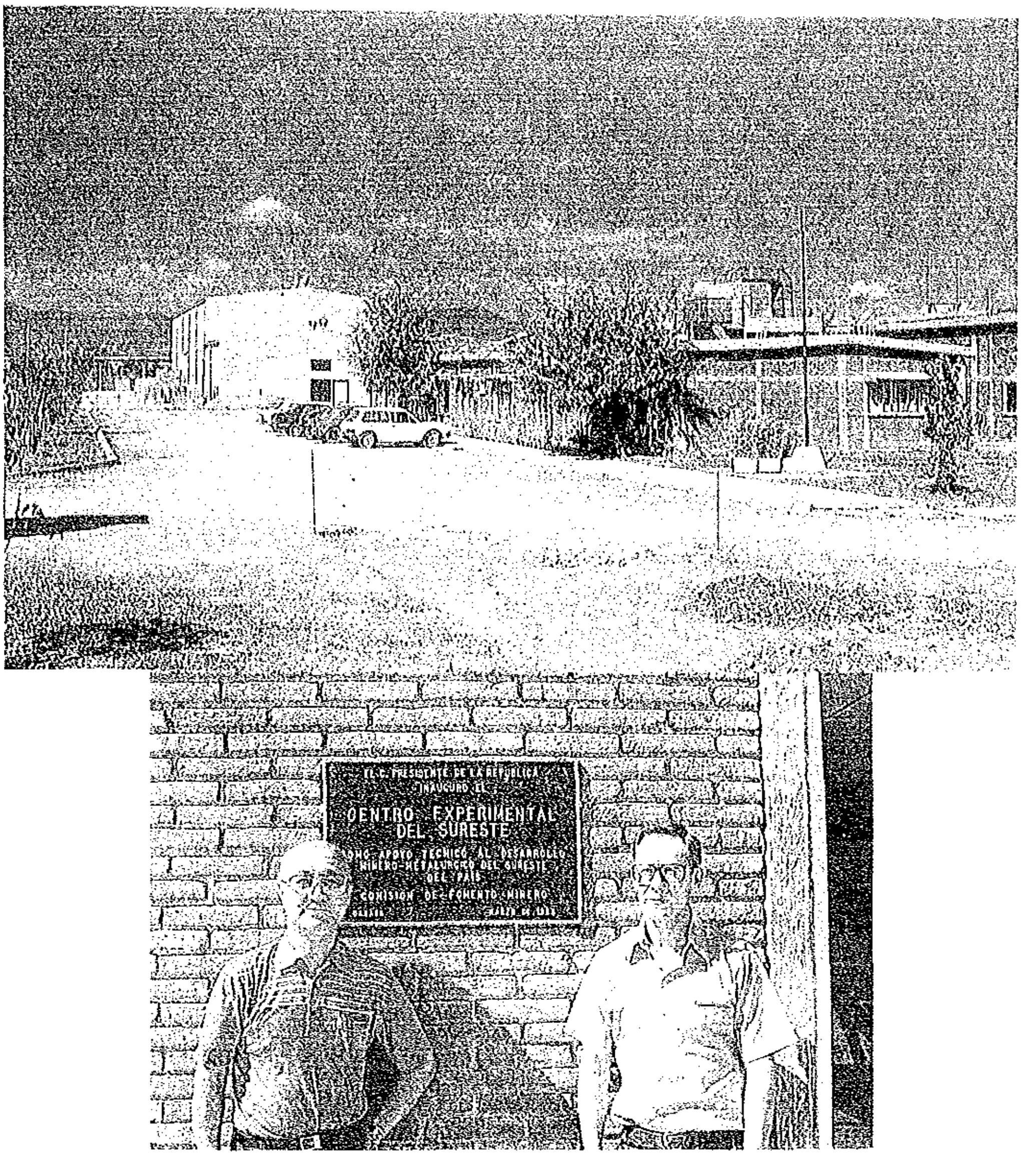
Asignación del personal calificado necesario.

Construcción de la planta piloto.

Instalación de los equipos y suministro de materiales.

Operación de equipo tanto de laboratorio como de planta piloto.

Todo tiene como base el proceso Tec-Kowa para *la recuperación de metales como* Oro, Plata, Cobre, Plomo, Zinc, etc., de las piritas al mismo *tiempo que se obtiene pelets de alta calidad* y gases sulfurosos que se pueden emplear para la fabricación de ácido sulfúrico.

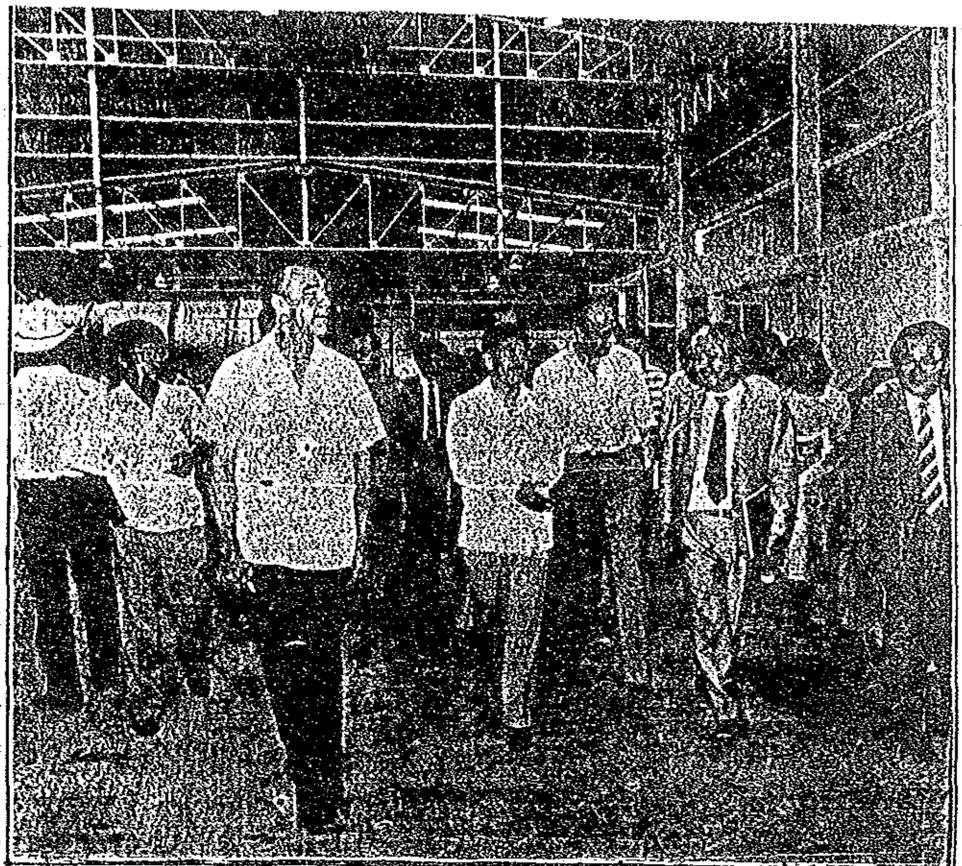


Centro Experimental del Sureste. San Lorenzo Cacaotepec, Etla, Oaxaca
Apartado Postal 1468 Oaxaca, México 68000 Tel. 6-66-85, 6-60-90

COMISION DE FOMENTO MINERO
Av. Puente de Tecamachalco No. 26,
Lomas de Chapultepec,
11000 México, D.F.
Tel. 540-34-00

AGENCIA DE COOPERACION
INTERNACIONAL DEL JAPON
Shinjuku Mitsui Bldg.,
2-1-1, Nishi-Shinjuku, Shinjuku-ku
Tokio, JAPON
Tel. 03-346-5311 Telex: J22271

JICA DE MEXICO
c/o Embajada del Japón
Paseo de la Reforma No. 395,
Col. Cuauhtémoc, México, D.F.
Tel. 514-00-29, 533-20-44



El intercambio de tecnología México-Japón, ha permitido la instalación de la Planta Piloto Piro-Hidrometalúrgica, única en Latinoamérica, que fue inaugurada por el Gobernador del Estado, Heladio Ramírez López.

Tecnología Japonesa Moderniza la Minería

* La Planta de San Lorenzo Cacaotepec, Unica en Latinoamerica

セレモニーの模様を報じる地方紙"Rotafivo"(4.13付)

SAN LORENZO CACAOTEPEC, ETLA, 12 DE ABRIL.- Por el alto potencial minero con que cuenta Oaxaca y por su vocación natural para esta actividad dentro del proceso de reconversión industrial impulsado por el Gobierno Federal en el marco del Convenio de Cooperación Técnica México-Japón, se construyó la planta Piloto Piro-Hidrometalúrgica para el aprovechamiento integral de minerales piritosos.

Lo anterior se puso de manifiesto al inaugurar el gobernador del Estado, Heladio Ramírez Lopez las instalaciones en donde técnicos especializados del Japón aportan sus conocimientos para la instalación de esta planta considerada única en Latinoamérica, por lo sofisticado de la tecnología aplicada.

El mandatario oaxaqueño subrayó la importancia de este complejo industrial, que beneficiará no solo a Oaxaca sino a todo el país.

Expresó que el Gobierno del Estado respalda y apoya todas las acciones que se encaminen a lograr un desarrollo del

A la par de esta urbanización se desarrolló la ndustrialización del país, trayendo consigo nuevos movelos de vida y nuevas necesidades a atisfacer. Convitiéndose as' en una sociedad consumista más despreocupada de los problemas y desequilibrios ecológicos que enfrentarí mos en el futuro.

Actualmente, el problema ambiental en la ZMCM se ha tornado crítico, dándose le prioridad a la contaminacion causada por las fábricas y los vehículos automoto

tida entre los oaxaqueños.

CONFIANZA DE JAPON EN MEXICO.

El ministro de la Embajada de Japón en México, Noritake kai, expuso que dada la confianza que existe en el Gobierno Mexicano y del Estado, su gobierno aporta los esfuerzos para modernizar los procesos de recuperación de minerales que permitirán desarrollar la pequeña y mediana minería en Oaxaca y el país.

Expuso que este proyecto es parte del convenio suscrito entre la SEMIP y el Gobierno Japones para el intercambio de tecnología. Indicó que la maquinaria fue totalmente donada por Japón, con un costo de 7 mil 400 millones de pesos.

Señaló que esto constituye la primera fase del proceso y que posteriormente se iniciará la etapa de intercambio de tecnología; elogió la participacion del personal de la Comisión de Fomento Minero, que con su experiencia podrán aprovechar los equipos para alcanzar el procesamiento de los residuos minerales.

ACCIONES VISIONARIAS.

Por su parte, el director general de la Comisión de Fomento Minero, Luís de Pablo Serna, apuntó que esta planta piloto permitirá en un futuro muy cercano que México aproveche a escala industrial yacimientos vulcanogenicos y polimetalicos que hasta ahora no son explotados así cómo mejorar los sistemas de recuperación reciclando los subproductos de plantas de beneficio en operación.

Informó que se han iniciado los trabajos preparatorios en la mina de Campo Morado para qué suministre material a la planta y se estudien las condiciones para producir concentrados de pirita a partir de las colas finales de algunas plantas del país.

El representante de la Agencia Internacional de Cooperación de Japón, Shozo Kakuno, informo que la planta entrará en operación a partir de agosto; tiene capacidad para recuperar minerales de gran valor de oro, plata, cobre y mineral de sulfuro con lo que se puede obtener acido sulfurico.

Aunado a ello, será posible establecer competencia internacional en estos productos y elevar el desarrollo económico de la región. Puntualizó que el equipo se ha desarrollado aplicando tecnología sofisticada tomando en cuenta que en Japón son escasas las minas ricas.

Agregó que dentro del intercambio de tecnología también se establece la capacidad en la explotación, refinación y analisis de las minas y sus productos.

PLANTA PILOTO

La planta operativa se ubica a un costado del Centro Experimental del Sureste, y consiste en aprovechar integralmente los residuos ricos en piritas, en donde sse encuentran aleados minerales como oro, plata, zinc, cobre y plomo que actualmente no son aprovechables.

A través de sistemas de flotación, se podrá obtener concentrados de zinc, cobre y plomo igualmente piritas, la cual pasará a otro proceso en donde se obtendrán sulfatos de plomo con valores de oro y plata y residuos de hidroxidos de cobre y zinc, con valores de oro y plata

Los sistemas utilizados son de lo mas sofisticados dentro de la industria metalurgica entre los que se destacan los de flotación para la obtención de plomo, cobre y zinc, de tostación de la pirita para la obtención de acido sulfurico, peletizado para la pirita calcinada, asimismo de volatización de los pelets secos y obtener pelets cocidos, para luego obtener cloruros gaseosos, los cuales son procesados por recuperación de gases y obtener compuestos de plomo, cobre y zinc, con valores de plata y oro

Dentro del convenio de cooperación se establece por parte del Gobierno Japones la asignación de expertos; entrenamiento de personal mexicano en Japón donación de equipo para laboratorio y la planta piloto, capacitación en México del personal asignado. Por México la asignacion de personal calificado necesario, construcción de la planta piloto instalación de los equipos y suministro de materiales y operación del equipo

Al final los tecnicos japoneses hicieron un reconocimiento a los tecnicos mexicanos y oaxaqueños quienes demostraron gran capacidad para la instalación del equipo

En pirita, Oaxaca será líder latino

* Convenio Japón-Oaxaca

Luis Ramírez

Como parte del proceso de reconversión industrial impulsado por el Gobierno Federal y en el marco del convenio de cooperación técnica entre México y Japón, el gobernador Heladio Ramírez López, inauguró ayer la Planta Piloto Piro-Hidrometalúrgica para el aprovechamiento integral de minerales piritosos, la única en el país y la más importante de América Latina.

Dicha planta piloto, ubicada en San Lorenzo Cacaotepec, Etla, abre la posibilidad de que en el futuro cercano México aproveche a escala industrial yacimientos vulcanogénicos, así como que pueda mejorar las recuperaciones reciclando subproductos de plantas de beneficio en operación.

En su intervención, el director General de la Comisión de Fomento Minero, Luis de Pablo, sostuvo que a pesar de la dramática crisis económica que agobia al país, la Secretaría de Energía, Minas e Industria Paraestatal (SEMIP), ha buscado con imaginación respuestas distintas, para poder contrarrestar los efectos de la inflación.

Por fortuna -dijo- en esta búsqueda hemos encontrado colaboración y respaldo por parte de los japoneses. Se está llevando a cabo un esfuerzo de intercambio tecnológico que no ha sido gravoso para el país, subrayó.

Consideró que por las limitaciones económicas que hay, el poder aprovechar mejor los recursos en estos momentos tan difíciles para México, es un punto de partida que permite un ritmo de desarrollo más rápido y completo.

Al ser entrevistado por "NOTICIAS", Luis de Pablo, indicó que la capacidad de procesamiento de la planta piloto, será de 6 toneladas diarias y que empezará a funcionar a partir del próximo mes de agosto, pero agregó que la trascendencia de este proyecto no radica en el monto del material procesado sino en el nivel de recuperación de metales que hasta el momento no han sido aprovechados lo suficientemente en el país.

Estableció que dicha planta, procesará metales como oro, plata, cobre, plomo y zinc, entre otros -que se dan en todo el sureste del país, pero fundamentalmente en los estados de Oaxaca y Guerrero y que permitirá aprovechar los compuestos

EL INTERCAMBIO DE TECNOLOGIA México-Japón, ha permitido la instalación de la planta piloto Piro-Hidrometalúrgica, única en Latinoamérica, que fue inaugurada ayer.

Agregó que el destino del material procesado será la comercialización, al igual que el resto de los productos metalúrgicos, y los recursos que se obtengan de éstos, serán destinados para facilitar el trabajo de nuevas investigaciones que coadyuvarán al desarrollo de la pequeña y mediana minería.

Asimismo, afirmó que en ninguna otra entidad del resto del país, está contemplado instalar otra planta de este tipo, por los altos costos que esto representa, por lo que es la primera a nivel nacional y la más importante de Amérlica Latina. Con ello Oaxaxa ocupa un lugar primordial en el avance minero.

Por su parte, el gobernador Heladio Ramírez López, aseguró que respalda y apoya totalmente esta iniciativa, porque significa el desarrollo económico y social del Estado y destacó los esfuerzos realizados tanto por la SEMIP como por el gobierno de Japón, para sentar las bases de un centro experimental en el sureste del país.

En el acto estuvieron presentes, el ministro de la embajada de Japón, Noritake Kai y sus destacados compatriotas, Tetsu Wakana, Shozo Kakuno, Yutaka Hosono y Nomuki Kuji.

Este proyecto dio inicio en el mes de febrero de 1986, y se concluyó la primera fase. Su costo total será superior a los seis mil quinietos millones de pesos. Para el gobierno japonés, el área minera es una de las más importantes dentro de la cooperación técnica entre México y Japón.

"Noticias" (4. 13 付)

JICA