

Part The General

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Chapter 1 Introduction

1-1 The Background and Objective of the Survey

The Zacualpan area in the United Mexican States, target area for the survey, is of high potential for the massive sulfide deposits containing polymetallic ore, similar type of the Japanese Kuroko ore deposits. The Consejo de Recursos Minerales, (hereafter noted as COREMI) has aggressively conducted some exploration programs for the area in the past. The Mexican government requested the Japanese government to survey for mineral resources in the Zacualpan area.

The Japanese government responded to the request and decided to conduct an exploration program to discover the economical massive sulfide ore deposits.

1-2 Conclusions and Recommendation of the Second Year

1 Conclusions

Following surveys are carried out in second year: The geological and geochemical survey in the Aurora area and the Rancho Viejo area, the detail geological survey in the Santiago Salinas area and three drilling survey in the Aurora area.

The geology of the Aurora area is composed of the Villa Ayala Formation, the Pachivia Formation and intrusive rocks.

The Villa Ayala Formation is composed of schistose volcanic rocks (Lsh), schistose sedimentary rocks (Lss), andesites (Va1 ~ Va6, Vam), dacite (DCw, DCe, DCn, DCc, Vad) and sedimentary rocks (Us, Ust, Ms).

The Pachivia Formation consists of the layers (CFm) that are mainly composed of slate and volcanic rocks (CFv).

The geological structure is complicatedly controlled by the folding and fault structures whose axis is NNE to NNW with the gently inclined cleavage. As a whole, andesite Va-1 is located in the central part and sedimentary rocks surround it, the outsides of the sedimentary rocks andesites Va-2 ~ Va-5 are distributed. Dacite rock bodies are distributed in the south west and south east of the area and schistose volcanic rocks and sedimentary rocks occupy in the corner of the northwestern part of

the area. The Pachivia Formation is distributed in a belt with the direction of north to the south in the eastern part of the area. The Formation dips westward in appearance, but the horizon is judged to be overturned by the fossil age and the folding pattern.

There are massive sulfide type ore deposit and metalliferous vein type ore deposit as the mineralization of the Aurora area. Within the above massive sulfide ore deposit, the Capire, the Aurora and the Manto Rico ore deposit occur within the sedimentary rocks of the upper part of the Villa Ayala Formation. On the other hand, the Guadalupe and the Cruz Blanca deposit occur within the uppermost part of the Pachivia Formation. These ore deposits are relatively rich in Pb, Zn, Ag and Ba. As a result of this year's survey, the Santiago Salinas district and the La Campana district were found as the place of ore showing. The detail geological survey was carried out in the Santiago Salinas district and confirmed the horizon of occurrence of massive sulfide ore deposit.

Based on the geochemical survey, the zone that shows more than +1 of average alteration index of each rock facies is considered to reflect the halo of the alteration related to the massive sulfide alteration. It became obvious that there are high possibility of that Ag, As, Zn, Pb, Cd and Ba as the trace elements to the indication elements for metalliferous vein type and Au, Ag, As and S as the indication elements for massive sulfide type ore deposit are effective. Besides the above, principal component analysis can extract the anomaly related to the mineralization in the La Campana, the south of Velixtla, the Santiago Salinas and around the Capire to the Aurora deposits.

The horizon of massive sulfide ore deposit was observed in the shallow part of the drilling hole MJZC-1. Sulfide network was also observed within the footwall dacite. This horizon continues to the place of mineralization indicate of Tlanilpa and the drilling hole TN-14 that was already drilled. Drilling hole MJZC-2 intersected volcanic rocks that develop schistosity. Though the volcanic rocks show strong pyrite dissemination, the horizon of these volcanic rocks were judged to be lower than the horizon of massive sulfide ore deposit. Drilling hole MJZC-3 intersected the

sedimentary rock that is the same as the host rocks of the Capire and the Aurora deposit were observed in the depth of 149.5 meters. The weak pyrite dissemination and mineralized rock fragments were sampled in the same depth. Under the sedimentary rock, andesite lava of the Villa Ayala Formation that corresponds to andsite Va-4 of the surface was observed.

The geology of the Rancho Viejo area is composed of the Villa Ayala Formation, the Pachivia Formation.

The Villa Ayala Formation is composed of basalt to andesitic rocks (Va) and dacite (Vd). The quantity of the dacite is less than that in the Aurora area.

The Pachivia Formation is composed of basalt to andesitic tuff (CFv), limestone (CF_L), slate (CFs), and alternation of tuff and slate (CFt).

As the geological structure, cleavage with the direction of NNE ~ NNW develops as same as in the Aurora area, it shows that the folding structure in the NNE ~ NNW direction is dominant. The dip of the strata is west in appearance and the strata is generally overturned.

Though alteration accompanied with mineralization is observed in several places, all of them were small scale and the zones were limited.

Geochemical anomaly zones of alteration index are outlined in part of the northwestern district of the Rancho Viejo area by geochemical survey.

Considering the above facts, the north of Capire district, the Santiago Salinas district and La Campana district in the Aurora area, are considered to be the prospective zones for ore deposit, since those districts have thick distribution of hanging wall, geochemical anomaly and remarkable ore showing.

Although the distribution of the horizon of massive sulfide ore deposit and the hanging wall were developed in Rancho Viejo area, ore showing and marked geochemical anomaly are rarely observed. Consequently, the potential for ore deposit is considered to be small in the Rancho Viejo area.

2 Recommendation for the Third Year's Program

The distribution of sedimentary rocks related with massive sulfide deposits

(Capire deposit, Aurora deposit, etc.), ore showings, alteration zone and these relationships have been revealed by the second year's program. Distribution pattern of specific elements that indicate mineralization and geochemical characteristics in the surveyed area was outlined by geochemical survey.

The previous exploration data that was obtained in this survey, showed the existence of unexplored districts such as Santiago Salinas, La Campana and north of Capire deposit districts.

Massive sulfide type mineralization is expected in Santiago Salinas district where is underlain by hanging wall sediments and alteration occurred in footwall dacite accompanying mineralization (Ba:1%).

There is little previous exploration in La Campana district located in the west of Manto Rico deposit, due to private mining concession. But, this survey has defined geochemical anomaly, ore showings and ore horizon in the district. Moreover, Drilling hole MJZC-2 encountered footwall alteration and mineralization which are correspond to the exposure in the creek situated to the west of Otates. Therefore, Massive sulfide ore body is expected in the depth of 200-300m below the surface between Manto Rico deposit and La Campana.

Exploration program must be advanced in north of Capire deposit district where exhibits geochemical anomaly and alteration zone, and is expected the continuation of mineralization intersected hole TN-14. Since the previous drilling did not confirm the ore horizon below thick sedimentary rocks, the deep drilling program is desirable.

As mentioned above, farther investigations must be recommended in the followings prospective districts to confirm continuation of mineralization and ore horizon.

1. Santiago Salinas district
2. La Campana district
3. North of Capire deposit district

1-3 Outline of Phase

1 Survey Area

Santiago Salinas district, Capire district and La Campana district are established by second year's survey.

2 Survey Method and Contents

The third year's program includes geological and geochemical surveys in Capire district and La Campana district, and drilling survey in Santiago Salinas district, Capire district and La Campana district. Contents and amount of the survey are listed in following table.

List of Survey Amount

Method and Contents		Amount		
Geological survey				
Aurora area La Campana district	Survey area	4km ²		
	Survey line	16km		
	Mapping scale	1/2,500		
	Sample number	40		
	Sampling density	10/km ²		
	Standard sample	2		
Aurora area Capire district	Survey area	4km ²		
	Survey line	16km		
	Mapping scale	1/2,500		
	Sample number	40		
	Sampling density	10/km ²		
	Standard sample	2		
Drilling Survey				
District	Hole No.	Depth(m)	Inclination	Azimuth
Santiago Salinas	MJZC-4	201.5	-90 °	-
	MJZC-5	264	-90 °	-
Capire	MJZC-6	300	-90 °	-
	MJZC-7	300	-90 °	-
La Campana	MJZC-8	200	-90 °	-
	MJZC-9	200	-90 °	-
Total		1465.5		

List of Laboratory Tests

Contents	
Geological Survey (Capire district, La Campana district)	
Thin section	20
Polish section	20
Ore assay (Au, Ag, Cu, Pb, Zn, Ba, Fe, S)	10
X-ray diffraction	80
Chemical analysis (Ag,Al,As,B,Ba,Be,Bi,Ca,Cd,Co,Cr,Cu,Fe,K,Mg,Mn,Mo,Na,Ni,P,Pb,S,Sb, Sr,Ti,V,W,Zn,Au)	80 (standard 4)
Drilling Survey (MJZC-4, MJZC-5, MJZC-6, MJZC-7, MJZC-8, MJZC-9)	
Thin section	35
Polish section	35
Ore assay (Au, Ag, Cu, Pb, Zn, Ba, Fe, S)	35
X-ray diffraction	35
Chemical analysis (Ag,Al,As,B,Ba,Be,Bi,Ca,Cd,Co,Cr,Cu,Fe,K,Mg,Mn,Mo,Na,Ni,P,Pb,S,Sb, Sr,Ti,V,W,Zn,Au)	35 (standard 2)

3 Participant Member List of the Survey

Members participated in the field survey in Mexico are as follows.

Survey team

Japanese side

Shigehisa Fujiwara Head of survey team, Geotechnos Co., Ltd.

Hiroshi Jingu Geotechnos Co., Ltd.

Mexican side

Ing. Gerardo Mercado Pineda COREMI

Ing. Arturo Ruiz Ortiz COREMI

Ing. Carlos Bon Aguilar COREMI

Supervisor in Mexico

Hiroshi Kubora Mineral Resources Survey Department, MMAJ

Masayoshi Itoh Representative of Mexico City office, MMAJ

4 Period of the Survey

Field survey was carried out as follows.

Geological survey term:

July, 28, 2003 ~ August, 19 , 2003

Analysis and compilation of field data

August, 20 , 2003 ~ August, 26 , 2003

Drilling survey term:

July, 30, 2003 ~ November, 11 , 2003