

TECHNICAL SERVICE REPORT

*Microscopical Examination
Of Five Mill Products
Submitted by
Anvil Mines Corp., Ltd.*

PROJECT NO. 1740 005052

CYANAMID

CYANAMID INTERNATIONAL
Mining Chemicals
Wayne, New Jersey

AMERICAN CYANAMID COMPANY

TECHNICAL SERVICE REPORT

Microscopical Examination of Five Mill Products
Submitted by Anvil Mines Corporation Ltd.

PROJECT NO. 1740

INTRODUCTION

On June 15, 1970, Mr. W. H. Thomas of Cyanamid of Canada submitted five samples of mill product composites of May 6 and 7, 1970 from Anvil Mining Corporation Ltd., Faro, Yukon Territory, to Cyanamid's Technical Sales Service Laboratory for microscopical examination.

The samples, with the following assays recorded on their envelopes, were received at our Stamford Laboratories in good condition:

<u>Product</u>	<u>Wt. Grams</u>	<u>% Pb</u>	<u>% Zn</u>	<u>% Fe</u>
(1) Pb Scavenger Tail	352	0.5	8.3	27.0
(2) Pb Concentrate	1032	70.5	5.5	4.6
(3) Zn Scavenger Tail	625	0.4	1.8	39.9
(4) Zn 1st Cleaner Tail	368	4.8	30.9	20.3
(5) Zn Concentrate	475	3.4	49.5	11.5

In the covering memo of May 29, 1970, to Mr. H. Hartjens, Mr. Thomas requested that a microscopical investigation be conducted to determine the nature of the diluents, middling particles and silver content of the lead concentrate, and the iron content and mineral composition of the zinc samples.

SUMMARY

1. A representative portion of each submitted sample was assayed with the following results:

<u>Product</u>	<u>oz. Ag/ton</u>	<u>% Pb</u>	<u>% Zn</u>	<u>% Fe</u>
Pb Scavenger Tail	--	0.90	8.34	27.8
Pb Concentrate	14.70	71.2	6.10	4.7
Zn Scavenger Tail	--	0.75	1.57	39.2
Zn 1st Cleaner Tail	--	4.80	32.13	21.0
Zn Concentrate	1.70	3.20	50.03	11.3

2. Although the Pb Concentrate contained 14.7 oz. Ag/ton, no silver mineral or metallic silver was found. Tetrahedrite was identified and may carry silver; however, not enough tetrahedrite was found to account for 14.7 ounces silver.

The Pb Concentrate contained an appreciable amount of "apparently free"* sphalerite, galena-sphalerite middling particles, galena-pyrite and galena-pyrrhotite locked particles.

3. The +20 micron fraction of the Zn Concentrate contained abundant "apparently free" pyrite particles in addition to pyrite, pyrrhotite and marcasite locked with sphalerite. The sphalerite was dark brown to dark amber in color, indicating the presence of considerable iron in solid solution.

*Statistically, the proportion of truly free mineral grains in any sample is generally smaller than the proportion observed as "apparently free" in a polished section.

4. An Infralyzer analysis revealed that 50.3% of the lead in the Pb Scavenger Tail occurred in the Cone 7 fraction (less than 10 microns), which comprised only 23.9% of the sample weight. In the coarser sizes, the lead was mainly in the form of small galena inclusions in transparent gangue, pyrite, pyrrhotite, marcasite, and sphalerite particles.

5. The Zn Scavenger Tail contained "apparently free" sphalerite and middling particles of sphalerite with transparent and/or sulfide gangue. Galena in this product appeared locked similarly to that in the Pb Scavenger Tail.

6. In the Zn 1st Cleaner Tail, approximately 50% of the sphalerite appeared to be free. The remaining sphalerite was locked approximately equally with transparent gangue and sulfide minerals. An appreciable amount of the galena in this product also appeared to be free, especially in the finer sizes.

TEST PROCEDURES AND RESULTS

A. Head Analyses

Representative portions of the five mill products were assayed. The results are shown in TABLE I.

TABLE I

<u>Product</u>	<u>oz. Ag/ton</u>	<u>% Pb</u>	<u>% Zn</u>	<u>% Fe</u>
Pb Scavenger Tail	--	0.90	8.34	27.8
Pb Concentrate	14.70	71.20	6.10	4.7
Zn Scavenger Tail	--	0.75	1.57	39.2
Zn 1st Cleaner Tail	--	4.80	32.13	21.0
Zn Concentrate	1.70	3.20	50.03	11.3

B. Screen Analyses

Representative 25-gram portions of the lead and zinc concentrates were wet screened through 325 mesh and 20 micron stainless steel sieves. Portions of the +325 mesh and -325 mesh +20 micron fractions were retained for microscopical investigation and all three size fractions were submitted for lead and zinc assays. The results are shown in TABLES II and III.

In the lead concentrate sample, the lead was evenly distributed throughout the whole size range but the zinc was concentrated to a certain extent in the coarser sizes. The small amount of sample available in the various screen fractions did not permit silver assays.

In the zinc concentrate sample, the zinc was evenly distributed throughout the whole size range, but the lead was relatively concentrated in the minus 20 micron fraction. The weights of the various screen fractions were too small to run silver assays.

C. Screen and Infrasizer Analyses

Representative 200 gram portions of the Pb Scavenger Tail, Zn Scavenger Tail, and Zn 1st Cleaner Tail were sized in a Haultain Infrasizer. The Cone 1 fractions were then screened on 48, 65, 100, 150, and 200 mesh Tyler sieves. The minus 200 mesh fraction was designated as Cone 1. The various fractions from the Pb Scavenger Tail were assayed for lead and the fractions from the Zn Scavenger Tail and Zn 1st Cleaner Tail for zinc.

The results of the screen and Infrasizer analyses are shown in TABLES IV, V, and VI. The approximate grain sizes of materials in the various screen and cone fractions are shown in TABLE VII.

These results show a definite concentration of lead in the Cone 7 fraction of the Pb Scavenger Tail; i.e., 50.3% of the lead in 23.9% of the sample weight.

In the Zn Scavenger Tail, there was some concentration of zinc in the +150 mesh screen fractions; i.e., 61.8% of the zinc in 44.3% of the sample weight.

In the Zn 1st Cleaner Tail, the zinc was fairly evenly distributed in the various particle sizes, with only a slight increase in zinc distribution in fractions coarser than Cone 2 (+29 microns).

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TABLE II

Product: Pb Concentrate Test: Mill Product

<u>Product</u>	<u>% Weight</u>	<u>Assays</u>		<u>Distribution</u>	
		<u>% Pb</u>	<u>% Zn</u>	<u>% Pb</u>	<u>% Zn</u>
+325 Mesh	8.66	58.40	10.78	7.06	15.18
-325 M +20 micron	38.83	67.90	7.93	36.77	50.07
-20 micron	52.51	76.70	4.07	56.17	34.75
Calc. Pb Conc.	100.00	71.698	6.15	100.00	100.00

TABLE III

Product: Zn Concentrate Test: Mill Product

<u>Product</u>	<u>% Weight</u>	<u>Assays</u>		<u>Distribution</u>	
		<u>% Pb</u>	<u>% Zn</u>	<u>% Pb</u>	<u>% Zn</u>
+325 Mesh	17.94	1.70	49.42	8.98	17.76
-325 M +20 micron	33.14	2.10	50.64	20.48	33.61
-20 micron	48.92	4.90	49.63	70.54	48.63
Calc. Zn Conc.	100.00	3.40	49.93	100.00	100.00

TABLE IV

ASSAY SIZE ANALYSIS SHEET

PROJECT 1740 COMPANY Anvil Mining Corporation Ltd.

DATE June 18, 1970

TEST Mill Prod. PRODUCT Pb Scavenger Tail

BY J.C. Jankovich

NUMBER		SIZE	WEIGHT			ASSAY - %			CONTENT			DISTRIBUTION - %		
ASSAY	MICRO	MESH OR CONE	GRAMS	% ON	% CUM	Pb	Zn	Fe		Pb			Pb	
		ASSAY HEAD				0.90	8.34	27.8						
		CALC. HEAD	200.00	100.00	100.00	0.806				0.8061			100.00	
		+ 48	1.6	0.80	0.80	0.80				.0064			-0.79	
		- 48 + 65	2.7	1.35	2.15	0.65				.0088			1.09	
		- 65 + 100	6.5	3.25	5.40	0.75				.0244			3.03	
		- 100 + 150	12.2	6.10	11.50	0.70				.0427			5.30	
		- 150 + 200	21.8	10.90	22.40	0.60				.0654			8.11	
		- 200 + CONE 1	20.7	10.35	32.75	0.65				.0673			8.35	
		- 1 + 2	21.3	10.65	43.40	0.50				.0533			6.61	
		- 2 + 3	22.8	11.40	54.80	0.40				.0456			5.66	
		- 3 + 4	18.8	9.40	64.20	0.35				.0329			4.08	
		- 4 + 5	14.6	7.30	71.50	0.45				.0329			4.08	
		- 5 + 6	9.3	4.65	76.15	0.45				.0209			2.59	
		- 6 + 7	47.7	23.85	100.00	1.70				.4055			50.31	

TABLE V
ASSAY SIZE ANALYSIS SHEET

PROJECT 1740 COMPANY Anvil Mining Corporation Ltd.

DATE June 22, 1970

TEST Mill Prod. PRODUCT Zn Scavenger Tail

BY J.C. Jankovich

NUMBER		SIZE	WEIGHT			ASSAY - %			CONTENT			DISTRIBUTION - %		
ASSAY	MICRO	MESH OR CONE	GRAMS	% ON	% CUM	Zn	Pb	Fe		Zn			Zn	
		ASSAY HEAD				1.57	0.75	39.2						
		CALC. HEAD	200.00	100.00	100.00	1.55				1.5531			100.00	
		+ 48	8.3	4.15	4.15	2.44				0.1013			6.52	
		- 48 + 65	9.3	4.65	8.80	2.44				0.1135			7.31	
		- 65 + 100	25.1	12.55	21.35	2.79				0.3502			22.54	
		- 100 + 150	45.8	22.90	44.25	1.73				0.3962			25.51	
		- 150 + 200	48.6	24.30	68.55	1.06				0.2576			16.59	
		- 200 + CONE 1	24.5	12.25	80.80	0.86				0.1054			6.79	
		- 1 + 2	13.4	6.70	87.50	0.76				0.0509			3.28	
		- 2 + 3	6.2	3.10	90.60	0.86				0.0267			1.72	
		- 3 + 4	3.0	1.50	92.10	1.06				0.0159			1.02	
		- 4 + 5	1.8	.90	93.00	--				--			--	
		- 5 + 6	0.8	.40	93.40	1.12				0.0146			0.94	
		- 6 + 7	13.2	6.60	100.00	1.83				0.1208			7.78	

TABLE VI
ASSAY SIZE ANALYSIS SHEET

PROJECT 1740 COMPANY Anvil Mining Corporation Ltd.

DATE June 24, 1970

TEST Mill Prod. PRODUCT Zn 1st Cleaner Tail

BY J.C. Jankovich

NUMBER		SIZE	WEIGHT			ASSAY - %			CONTENT			DISTRIBUTION - %		
ASSAY	MICRO	MESH OR CONE	GRAMS	% ON	% CUM	Zn	Pb	Fe		Zn			Zn	
		ASSAY HEAD				32.13	4.80	21.0						
X	X	CALC. HEAD	200.00	100.00	100.00	31.68				31.677			100.00	
		+ 100	1.0	.50	.50	38.85				0.194			0.61	
		- 100 + 150	4.7	2.35	2.85	42.71				1.004			3.17	
		- 150 + 200	19.3	9.65	12.50	44.34				4.279			13.51	
		- 200 + CONE 1	37.4	18.70	31.20	34.98				6.541			20.65	
		- 1 + 2	40.3	20.15	51.35	32.75				6.599			20.83	
		- 2 + 3	25.3	12.65	64.00	29.90				3.782			11.94	
		- 3 + 4	16.0	8.00	72.00	27.46				2.197			6.94	
		- 4 + 5	9.0	4.50	76.50	31.32				1.409			4.45	
		- 5 + 6	7.3	3.65	80.15	30.10				1.069			3.37	
		- 6 + 7	39.7	19.85	100.00	23.19				4.603			14.53	

TABLE VII

APPROXIMATE GRAIN SIZES OF MATERIALS

IN INFRASIZER ANALYSIS

Cone	<u>Quartz</u>	<u>Sphalerite</u>	<u>Pyrrhotite</u>	<u>Pyrite</u>	<u>Chalcocite</u>
	<u>Gravity</u>	<u>Gravity</u>	<u>Gravity</u>	<u>Gravity</u>	<u>Gravity</u>
	2.66	4.0	4.5	5.0	5.5
	<u>Micron</u>	<u>Micron</u>	<u>Micron</u>	<u>Micron</u>	<u>Micron</u>
	<u>Size</u>	<u>Size</u>	<u>Size</u>	<u>Size</u>	<u>Size</u>
1	+56	+46	+44	+41	+39
2	+40	+33	+31	+29	+28
3	+28	+23	+22	+20	+19
4	+20	+16	+16	+15	+14
5	+14	+11	+11	+10	+10
6	+10	+ 8	+ 8	+ 7	+ 7
7	-10	- 8	- 8	- 7	- 7

Cone	<u>Arsenopyrite</u>	<u>Cerussite</u>	<u>Cassiterite</u>	<u>Galena</u>	<u>Gold</u>
	<u>Gravity</u>	<u>Gravity</u>	<u>Gravity</u>	<u>Gravity</u>	<u>Gravity</u>
	6.0	6.5	7.0	7.5	19.3
	<u>Micron</u>	<u>Micron</u>	<u>Micron</u>	<u>Micron</u>	<u>Micron</u>
	<u>Size</u>	<u>Size</u>	<u>Size</u>	<u>Size</u>	<u>Size</u>
1	+37	+36	+35	+33	+21
2	+27	+26	+25	+24	+15
3	+19	+18	+17	+17	+10
4	+13	+13	+12	+12	+ 7
5	+ 9	+ 9	+ 9	+ 8	+ 5
6	+ 7	+ 6	+ 6	+ 6	+ 3.5
7	- 7	- 6	- 6	- 6	- 3.5

Calculations based on Stoke's Law:

Above figures were calculated on Stoke's Law neglecting the gravity of the medium in which the separation was made.

$$\frac{D_1}{D_2} = \frac{\sqrt{G_2}}{\sqrt{G_1}} \quad \frac{d_1}{d_2} = \frac{(g_2)^{\frac{1}{2}}}{(g_1)^{\frac{1}{2}}}$$

Vol. Factor $\left(\frac{1}{\sqrt{G}}\right)^3$ $v = \left(\frac{1}{G}\right)^{3/2}$

Size of Tyler Mesh Screen Openings

<u>Mesh</u>	<u>Micron</u>	<u>Mesh</u>	<u>Micron</u>
48	295	400	37
65	208	600	26
100	147	800	18
150	104	1200	13
200	74	1600	9
325	43	3200	5

D. Briquette Preparation

Representative portions of the +325 mesh and -325 mesh +20 micron fractions from the Pb and Zn Concentrates were briquetted. Representative portions of the -150 +200 mesh, Cone 2 and Cone 4 fractions from the Pb and Zn Scavenger Tails and Zn 1st Cleaner Tail samples were briquetted.

Each portion was cast into ACRYLITE® thermo-setting plastic, one inch diameter briquettes. The briquettes were then polished to a mirror finish and their surfaces examined under a metallurgical ore microscope in reflected light, using bright-field illumination, dark-field illumination, and polarized light.

E. Microscopical Examinations

1. Lead Concentrate

An appreciable amount of "apparently free" sphalerite, and galena-sphalerite, galena-pyrite and galena-pyrrhotite middling particles were observed in +325 mesh and -325 +20 micron screen fractions. "Apparently free" pyrite and marcasite particles were abundant (See Photomicrographs No. 1 and No. 3).

No silver minerals or metallic silver were observed, although the briquette surfaces were polished, examined, recut, repolished, and re-examined. Several tetrahedrite-tennantite particles were found which might contain silver; however, they did not seem sufficiently abundant for the 14.7 oz. Ag/ton assay. An attempt to find inclusions in galena by

differential etching using dilute nitric acid was unsuccessful. Argentiferous galena was suspected. Hand panning on a vanning plaque in an attempt to separate possible metallic silver showed no signs of silver.

2. Zinc Concentrate

The major iron-bearing minerals in the zinc concentrate were pyrite, pyrrhotite, marcasite, and chalcopyrite, in descending order of abundance. Both the +325 mesh and -325 mesh +20 micron fractions contained abundant "apparently free" pyrite particles and particles of pyrite, pyrrhotite, and marcasite locked with sphalerite. Most of the sphalerite was a dark brown to dark amber color, indicating the sphalerite contained appreciable iron in solid solution. Very little sphalerite was light yellow colored. The lead content occurred as galena inclusions of various sizes in sphalerite particles. Transparent gangue minerals were generally locked with sphalerite (See Photomicrographs No. 5 through No. 8).

3. Lead Scavenger Tail

The lead content of the three screen and cone fractions examined occurred as galena inclusions in transparent gangue minerals, pyrite, pyrrhotite, marcasite, and sphalerite. "Apparently free" galena particles were very rare.

TABLE IV showed that 50.3% of the lead occurred in the seventh cone fraction (particles which are finer than 10 microns); this fraction is too fine to polish and photograph successfully.

4. Zinc Scavenger Tail

The sphalerite in the Zinc Scavenger Tail occurred both "apparently free" and locked. The sphalerite locked in transparent gangue and sulfide particles varied from 50% middling particles down to inclusions of a few microns in size. Several pictures were taken showing the free and locked sphalerite (See Photomicrographs No. 13 through No. 16). The mode of occurrence of the lead was the same as in the Pb Scavenger Tail; i.e., galena locked in transparent gangue, pyrite, pyrrhotite, marcasite, and sphalerite.

5. Zinc 1st Cleaner Tail

At least 50% of sphalerite particles observed in the three fractions examined appeared to be free. The remaining sphalerite was associated approximately equally with transparent gangue and sulfide minerals (See Photomicrographs No. 17 through No. 20).

Several free galena particles were observed in Cone 4 fraction, whereas the galena observed in the -150 +200 mesh and Cone 2 fractions was locked, mainly with sphalerite. Appreciable free pyrite, pyrrhotite, and marcasite were contained in Cones 2 and 4 fractions.

COLOR PHOTOMICROGRAPHS

Particles may vary in size in any photomicrographic view according to the plane of the section polished and photographed.

The colors of the various minerals are, at times, only suggestive of the actual reflected color observed with the microscope due to difficulties of the printer capturing the true guide print colors. Colors may vary depending on type, number, and magnification of the minerals photographed in any cross section. The brown-olive color background, between particles, is the transparent ACRYLITE® thermo-plastic in which the particles were cast. The minerals were identified by direct microscopical examination and not by the finished photomicrograph print.

Some of the major particles and their inclusions have been labeled to identify the various minerals in the color photomicrographs. If the majority of the particles in a photomicrograph are the same mineral, then only a few have been labeled. The abbreviations used are as follows:

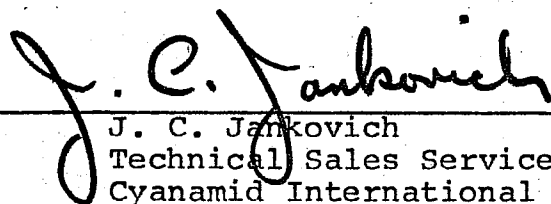
arsenopyrite = apy	marcasite = mar
chalcopyrite = cp	pyrite = py
galena = ga	pyrrhotite = po
hematite = hem	sphalerite = sp
transparent gangue minerals = gan	

When a mineral appears as an inclusion in another mineral, it has been labeled as follows: for example, chalcopyrite in sphalerite = $\frac{cp}{sp}$. Locked middling particles have been labeled as follows: for example, sphalerite and transparent gangue = sp-gan.

If possible, the parent minerals have been labeled below the line, as sphalerite is shown in the first example.

A micrometer eye-piece was used to measure the cross sections of the various particles and inclusions.

The black spots in the photomicrographs are areas where all, or portions of a particle, have been plucked from the briquette surface during the polishing procedure.



J. C. Jankovich
Technical Sales Service
Cyanamid International

cc
August 12, 1970

Attachments: Photomicrographic Section

Project No. 1740 Anvil Mines Corp. Ltd., Yukon Territory
Lead Concentrate Mill Sample

+325 Mesh Fraction, 8.66% Sample Wt., Assay: 58.4% Pb and 10.8% Zn

Photomicrograph No. 1
Magnification = 175x

A typical view of the +325 mesh particles showing free and locked galena (light grey) with appreciable amounts of sphalerite, pyrite, and pyrrhotite.

Photomicrograph No. 2
Magnification = 450x

Increased magnification of the +325 mesh particles showing galena free and locked with chalcopyrite, pyrite, pyrrhotite, sphalerite, and transparent gangue minerals.

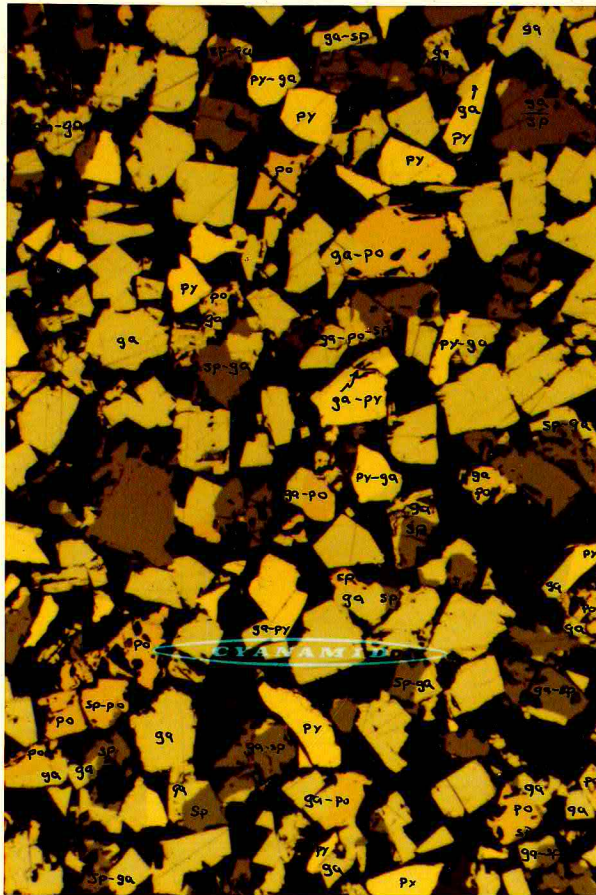
-325 Mesh +20 Micron Fraction, 38.8% Sample Wt., Assay: 67.9% Pb & 7.9% Zn

Photomicrograph No. 3
Magnification = 175x

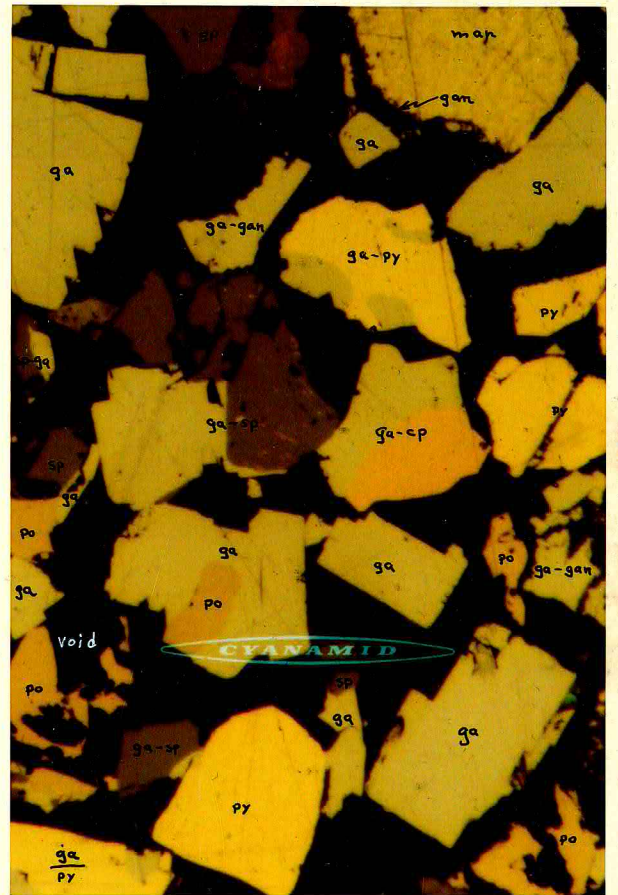
A typical view of the -325 mesh +20 micron particles similar to the +325 mesh fraction, but with somewhat less locked sphalerite.

Photomicrograph No. 4
Magnification = 700x

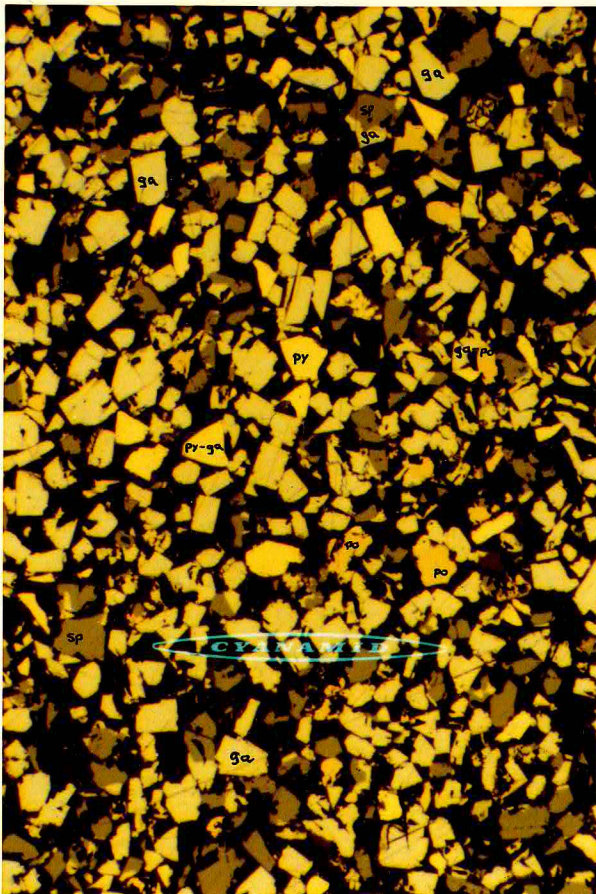
A close-up view of the -325 mesh +20 micron particles showing galena-chalcopyrite-sphalerite locking in a 40 x 43 micron particle (particle A). Locked galena-pyrrhotite particle "B" measured 20 x 27 microns in cross section.



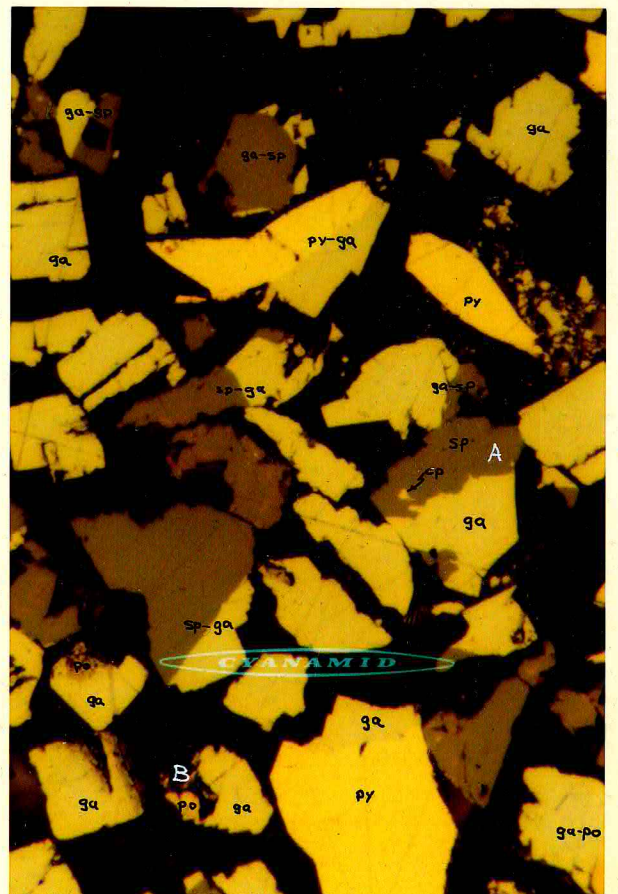
No. 1



No. 2



No. 3



No. 4

Project No. 1740 Anvil Mines Corp. Ltd., Yukon Territory
Zinc Concentrate Mill Sample

+325 Mesh Fraction, 17.9% Sample Wt., Assay: 1.70% Pb and 49.4% Zn

Photomicrograph No. 5
Magnification = 175x

A general view of the +325 mesh particles showing several "apparently free" pyrite particles, several pyrite-sphalerite and pyrrhotite-sphalerite locked particles. The lead in this fraction almost always appeared as galena inclusions in sphalerite. Several sphalerite particles with chalcopyrite inclusions can be seen.

Photomicrograph No. 6
Magnification = 450x

A close-up view showing small chalcopyrite inclusions in sphalerite and typical locking of sphalerite with transparent gangue, pyrite, pyrrhotite and galena.

-325 Mesh +20 Micron Fraction, 33.1% Sample Wt., Assay: 2.1% Pb and 50.6% Zn

Photomicrograph No. 7
Magnification = 175x

A typical view of the -325 mesh +20 micron particles showing several "apparently free" pyrite, pyrrhotite particles and many pyrite, pyrrhotite locked with sphalerite particles. Chalcopyrite free and locked with sphalerite is shown.

Photomicrograph No. 8
Magnification = 700x

The outlined area shown in the upper left corner of Photomicrograph No. 7 is shown in this photomicrograph. The encircled sphalerite-pyrrhotite middling particle measured 36 x 40 microns in cross section.

SADES PARK, N.1

VPD-M-500 NATIONAL OFFICE SUPPLY, FAIRSADES PARK, N.1

VPD-M-500 NATIONAL OFFICE SUPPLY, FAIRSADES PARK, N.1

-150 +200 Mesh Fraction, 6.10% Sample Wt., Assay: 0.60% Pb

Photomicrograph No. 9
Magnification = 175x

A general view of the -150 +200 mesh particles showing galena inclusions in a transparent gangue particle and galena attachments on two sides of a pyrite particle.

Photomicrograph No. 10
Magnification = 450x

A 126 x 180 micron locked pyrite-sphalerite-galena-transparent gangue particle showing typical galena locking. The galena area marked "A" measured approximately 16 x 27 microns.

Infrasizer Cone 2 Fraction, 10.7% Sample Wt., Assay: 0.50% Pb

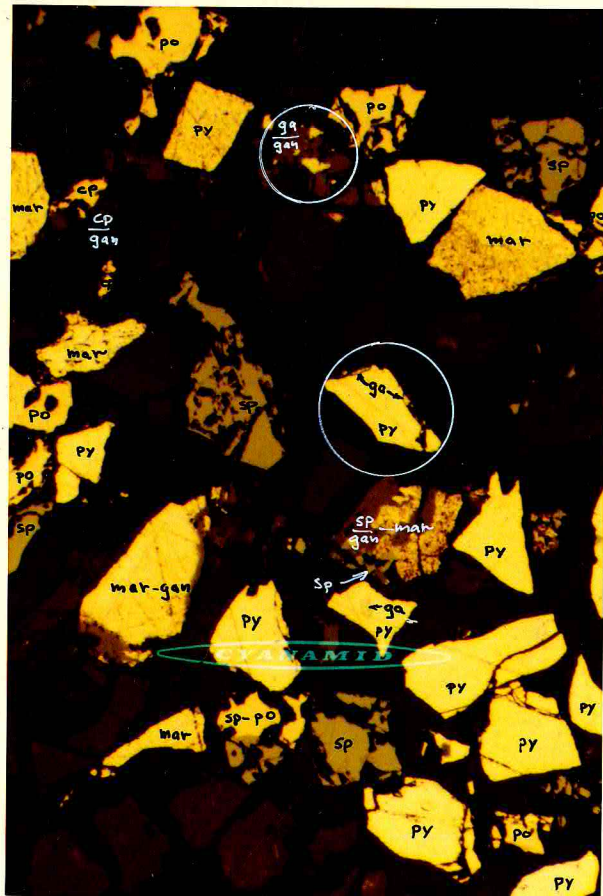
Photomicrograph No. 11
Magnification = 175x

A general view of Cone 2 particles (756 +24 micron particle size range) showing free arsenopyrite, chalcopyrite, marcasite, pyrite, pyrrhotite, sphalerite, and transparent gangue particles. The circled middling particle contains chalcopyrite, galena, and sphalerite.

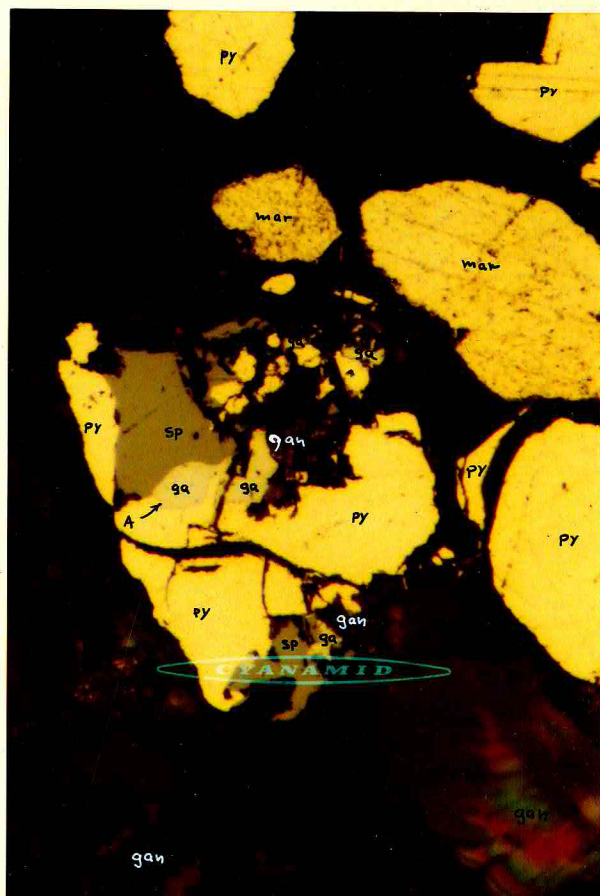
Infrasizer Cone 4 Fraction, 18.8% Sample Wt., Assay: 0.35% Pb

Photomicrograph No. 12
Magnification = 450x

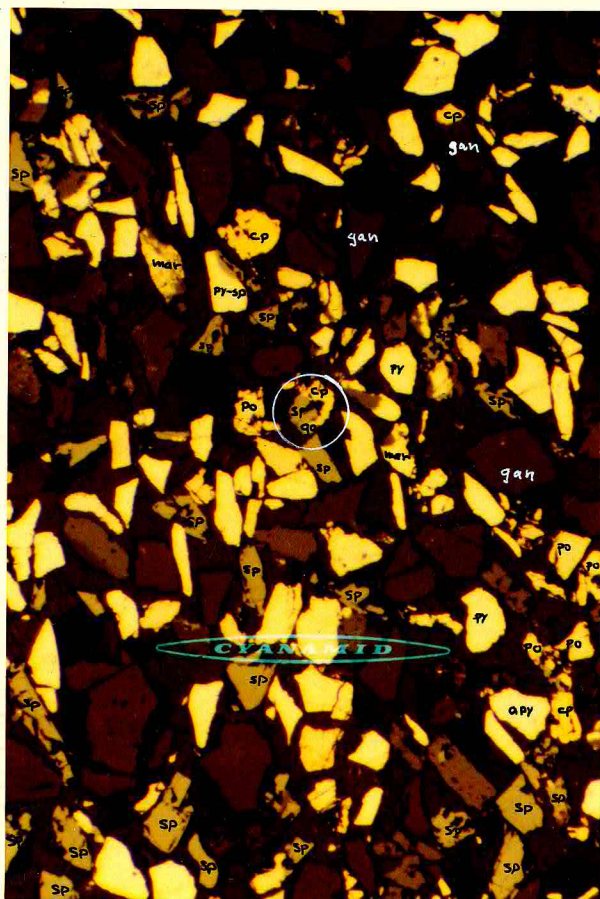
The two encircled particles (-28 +12 micron particle size range) show galena locked in two sphalerite particles. The vein of galena in the top circled particle measured approximately 3.6 x 12.6 microns.



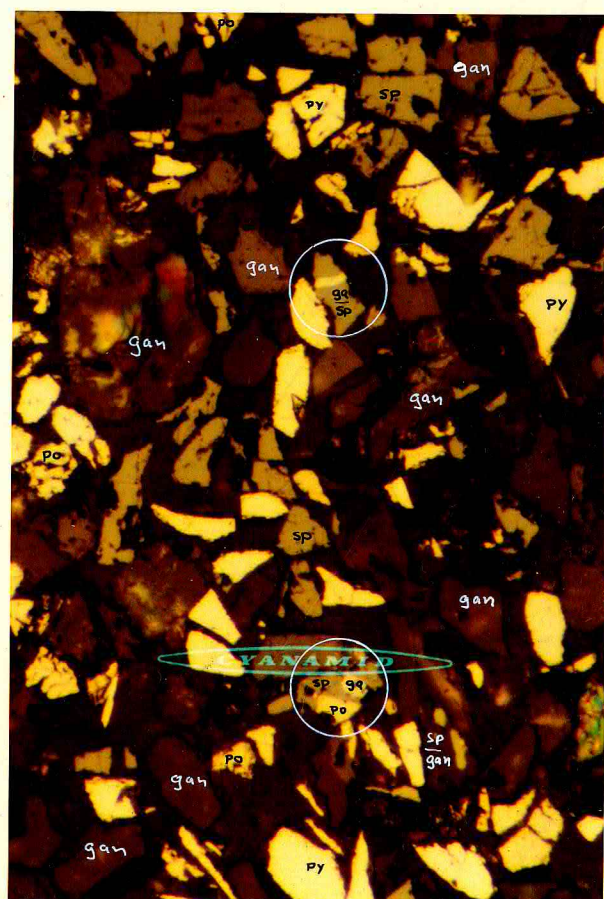
No. 9



No. 10



No. 11



No. 12

Project No. 1740 Anvil Mines Corp. Ltd., Yukon Territory
Zinc Scavenger Tailing

-150 +200 Mesh Fraction, 22.9% Sample Wt., Assay: 1.73% Zn

Photomicrograph No. 13
Magnification = 175x

A general view of the -150 +200 mesh particles showing a free sphalerite particle, a locked chalcopyrite-galena-sphalerite-transparent gangue particle, and pyrite-sphalerite particle. Several relatively large, free sphalerite particles were observed in this fraction; however, most sphalerite was locked.

Photomicrograph No. 14
Magnification = 450x

This view shows a 122 x 209 micron pyrite particle containing many galena and sphalerite inclusions. The galena inclusion marked "X" measured 4.5 x 12.6 microns. The pyrite particle in the upper right corner measured 104 x 117 microns, and the sphalerite inclusion approximately 16 x 54 microns.

Infrasizer Cone 2 Fraction, 6.7% Sample Wt., Assay: 0.76% Zn

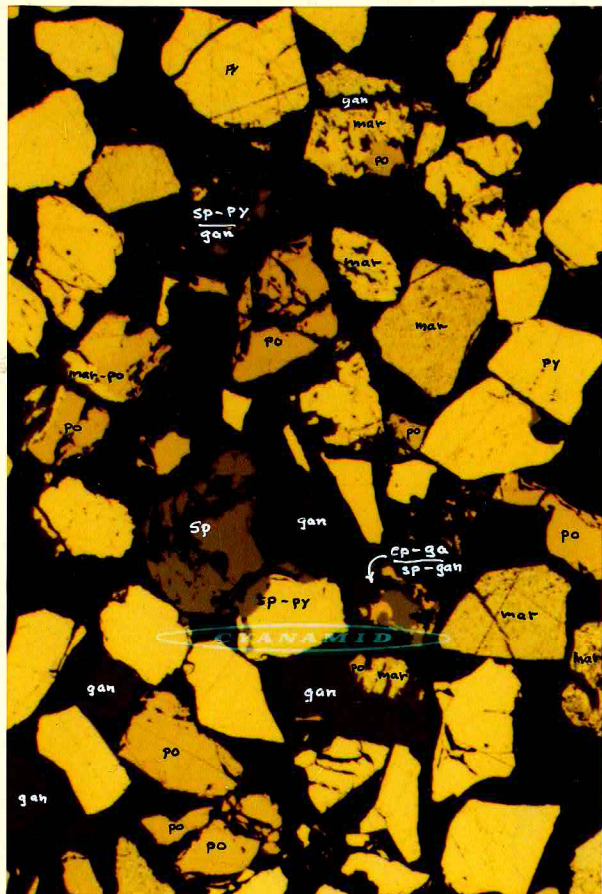
Photomicrograph No. 15
Magnification = 175x

A general view of Cone 2 Fraction (-54 +24 micron size range) showing two "apparently free" sphalerite particles and one locked.

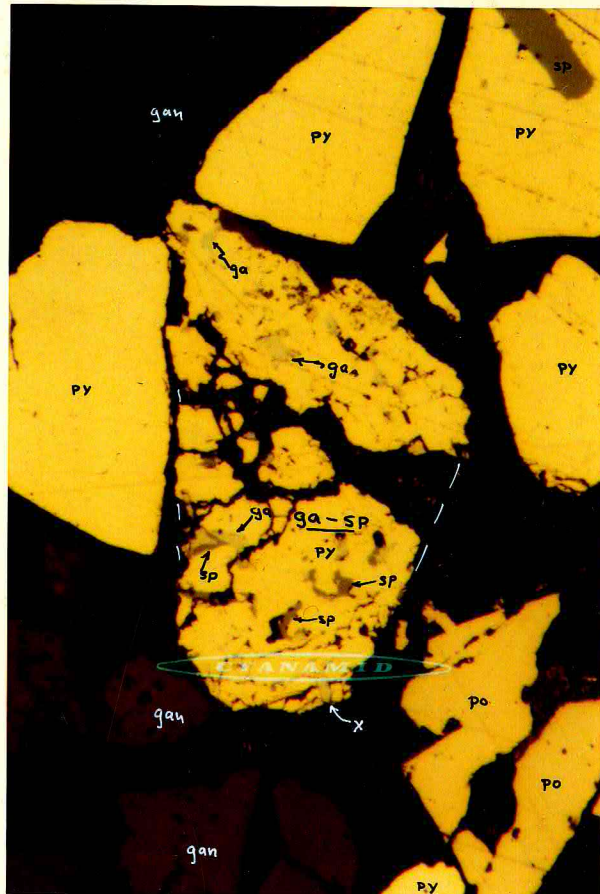
Infrasizer Cone 4 Fraction, 1.5% Sample Wt., Assay: 1.06% Zn

Photomicrograph No. 16
Magnification = 450x

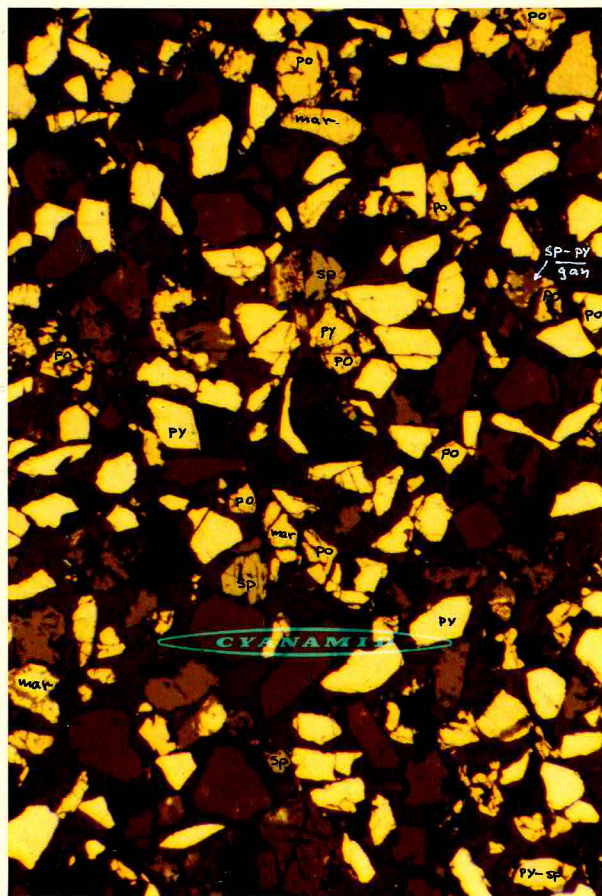
This view shows two free sphalerite particles and one locked sphalerite-pyrite particle. The encircled sphalerite measured 18 x 20 microns.



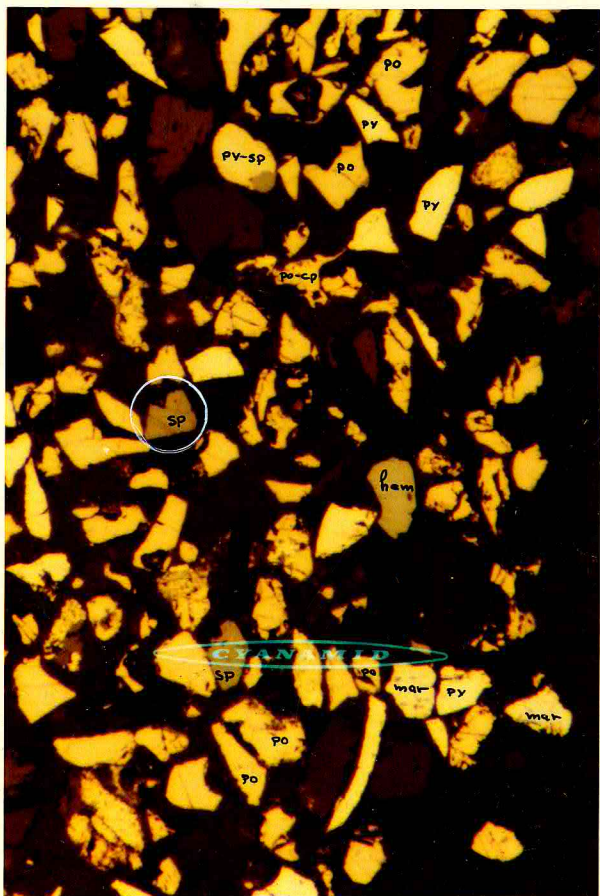
No. 13



No. 14



No. 15



No. 16

-150 +200 Mesh Fraction, 2.35% Sample Wt., Assay: 47.7% Zn

Photomicrograph No. 17
Magnification = 175x

This general view shows abundant free sphalerite and middling sphalerite particles with galena, marcasite, pyrite, pyrrhotite, and transparent gangue minerals.

Photomicrograph No. 18
Magnification = 450x

A 100 x 176 micron transparent gangue particle containing chalcopyrite, galena, pyrite, and sphalerite inclusions. The encircled triangular galena area measured 9.0 x 12.4 microns.

Infrasizer Cone 2 Fraction, 20.2% Sample Wt., Assay: 32.8% Zn

Photomicrograph No. 19
Magnification = 175x

A general view of the Cone 2 Fraction (-56 +24 micron particle size range) showing abundant free sphalerite; locked pyrite, pyrrhotite and/or transparent gangue with sphalerite; and several free chalcopyrite particles. A few "apparently free" galena particles were observed as well as galena locked in sphalerite.

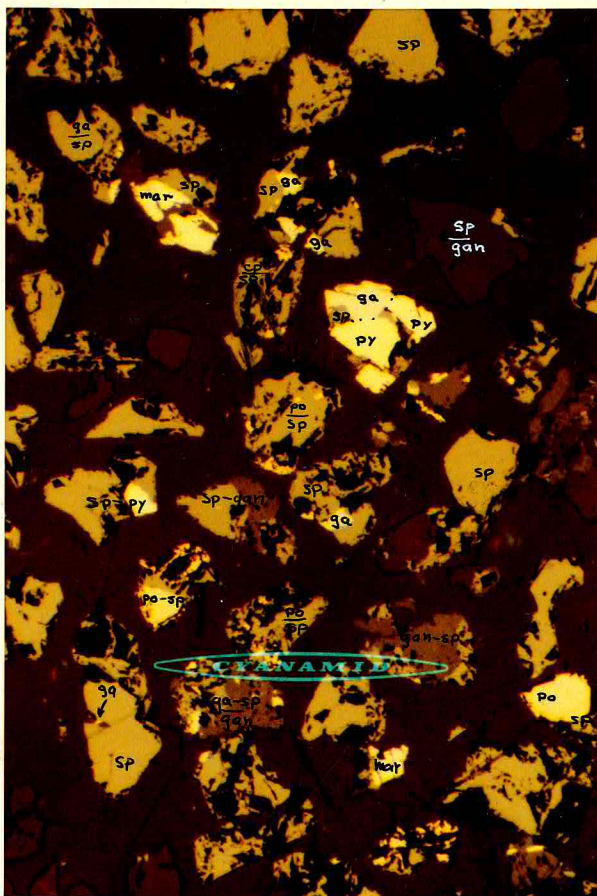
Infrasizer Cone 4 Fraction, 8.00% Sample Wt., Assay: 27.46% Zn

Photomicrograph No. 20
Magnification = 450x

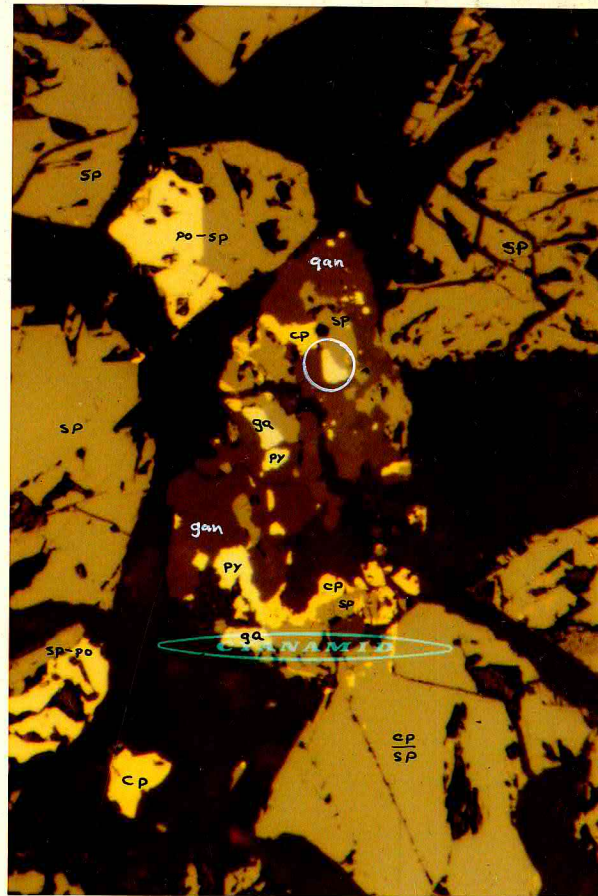
A general view of the Cone 4 Fraction (-28 +12 micron particle size range) showing abundant free sphalerite and sphalerite locked mostly with pyrrhotite. Some chalcopyrite and galena locked in sphalerite, but very little pyrite-sphalerite locking.

Several "apparently free" galena particles were observed in this fraction as in Cone 2. A free 23 x 25 micron galena particle and a galena-sphalerite particle are encircled.

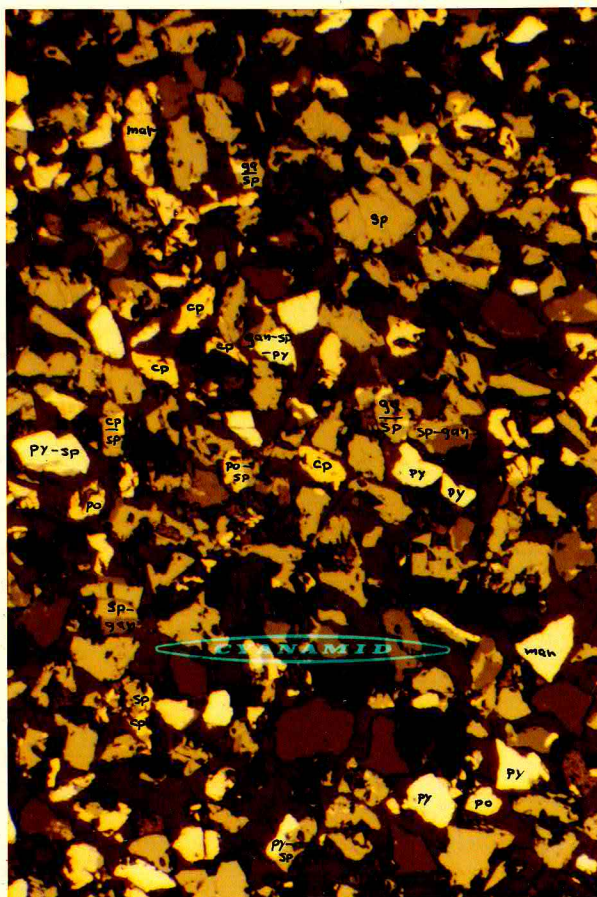
VPD-M-500 NATIONAL OFFICE SUPPLY, FALLSADES PARK, N.J.



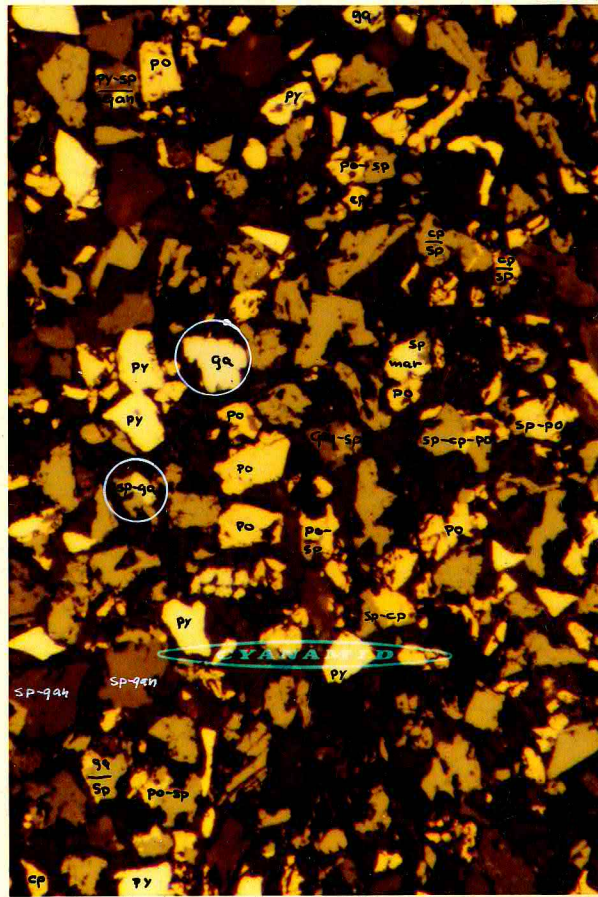
No. 17



No. 18



No. 19



No. 20