TECHNICAL SERVICE REPORT

Microscopical Examination Of a Final Lead Concentrate Sample From Anvil Mining Corporation Faro, Yukon Territory

PROJECT NO. 1844 005051

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INTRODUCTION

On December 3, 1971, Mr. S. A. MacKay of Cyanamid of Canada requested that we conduct a microscopical examination on a sample of final lead concentrate from Anvil Mining Corporation's operation in the Yukon Territory to determine the mineral associations.

The sample which weighed approximately 500 grams was received on December 15, 1971, in good condition.

The information, including suggestions, contained herein is based upon the best laboratory and technical information available to us. Any recommendations or suggestions are made without warranty or guarantee, since the conditions of use are beyond our control. Nothing contained herein shall be construed to imply the non-existence of any relevant patents nor to constitute a permission, inducement or recommendation to practice any invention covered by any patent owned by American Cyanamid Company or by others, without authority from the owner of the patent.

SUMMARY

1. A microscopical examination of the final lead concentrate showed the galena to be intimately associated with sphalerite in the whole range of particle sizes. Sphalerite was the major diluent mineral and occurred mainly as middling particles with galena. Sphalerite particles having small attachments of galena on the surface were also common.

2. Approximately 23% of the sample was plus 400 mesh, and in these coarser sizes galena-sphalerite middling particles were abundant. Free sphalerite particles were minor.

3. Pyrite was the second major diluent mineral and was observed both free and locked with galena. Many pyrite particles contained minute "attachments" of galena on their surfaces. Approximately 20-30% of the pyrite particles in the +400 mesh fraction appeared to be free.

4. Transparent gangue minerals, pyrrhotite, and chalcopyrite were the three other diluent minerals observed, but were not considered major diluents; they were usually locked with galena. Transparent gangue particles often contained small, disseminated galena inclusions and sphalerite often contained small chalcopyrite disseminated inclusions. Pyrrhotite occurred much like the pyrite in the concentrate.

TEST WORK PROCEDURES

Screening

In an attempt to determine the extent of locking in the coarse fraction of the lead concentrate which might benefit from regrinding, a portion of the submitted sample was wet screened on a 400 mesh screen. Approximately 23.1% of the concentrate was retained on the screen and was set aside for briquetting.

Briquette Procedure

A representative portion of the final lead concentrate as received and the dried +400 mesh fraction of the screen separation were each cast into one-inch diameter ACRYLITE® thermoplastic briquettes. The briquettes were 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.

Microscopical Examination

Briquette No. 5858 - Lead Concentrate as Received

Examination of the polished surface at low magnification (60x) showed galena to be the predominant mineral. However, at 300x magnification in every field of view (containing an average of 100 particles), approximately 20% was sphalerite, pyrite, pyrrhotite, transparent gangue and/or chalcopyrite diluent mineral. These diluents are listed in order of abundance, sphalerite being the greatest. Almost

every sphalerite particle examined had some galena locking exposed to the particle surface. In some particles, the galena portion amounted to a tip measuring only a few microns, or one face of a particle containing galena less than a micron thick.

Galena locking with pyrite occurred in the same manner as with sphalerite; however, an appreciable amount of "apparently free" pyrite was observed. It would be impossible to estimate the percentage because many particles were only a few microns in size.

Chalcopyrite was found generally locked with galena and sphalerite in the coarser particles and often free in the minus 10 micron size particles.

Briquette No. 5859 - Lead Concentrate +400 Mesh Fraction, 23.1% of Sample Weight

The major diluent in the +400 mesh fraction was sphalerite, followed closely by pyrite. The sphalerite occurred as described in the examination of the total concentrate.

Pyrite was observed "free" and locked with galena. Many pyrite particles contained minute "attachments" of galena (galena locking exposed to the particle surface rather than completely locked within pyrite). Approximately 20-30% of the pyrite particles in the +400 mesh fraction had no apparent galena locking.

Transparent gangue minerals, pyrrhotite and chalcopyrite were also diluents in the lead concentrate, but

were not considered major diluents. They were present as locked particles with galena. Many of the transparent gangue particles contained small galena inclusions and were often complexed with sphalerite, pyrite and/or chalcopyrite, as shown in Photomicrograph No. 7. Pyrrhotite occurred much like pyrite in the concentrate, although less abundant. Chalcopyrite was generally found locked with galena and as small inclusions in the sphalerite portion of some locked sphalerite-galena particles.

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 colored background between particles is the transparent ACRYLITE® thermoplastic 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 is the same mineral, then only a few have been labeled. The abbreviations used are as follows:

chalcopyrite	= cp
galena	= ga
pyrite	= py
pyrrhotite	= po
sphalerite	= sp
transparent gangue	= gan

Minerals appearing as fine inclusions in a matrix mineral have been labeled as follows: galena in transparent gangue = $\frac{ga}{gan}$. Locked middling particles have been labeled as follows: galena and sphalerite = ga-sp.

If possible, the parent mineral has been labeled below the line as transparent gangue is shown in the first example.

Particles referred to as "free" particles are those which appear to be free in the polished cross section. Statistically, the proportion of truly free mineral grains in any sample is generally smaller than the proportion observed as "free" particles in a polished section.

A micrometer eyepiece was used to measure the cross sections of the various particles or inclusions.

The black areas are voids where portions or all of a particle have been torn from the briquette surface during the polishing procedure.

Approximate Micron to Mesh Equivalents

Microns	Mesh
147	100
104	150
74	200
43	325
37	400
30	500
26	600
18	800
13	1200
9	1600
5	3200

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John C. Jankovich
Technical Sales Service
Cyanamid International

cc
January 25, 1972

Attachments: Photomicrographs

FINAL LEAD CONCENTRATE - AS RECEIVED

Photomicrograph No. 1
Magnification = 175x

A typical view of the lead concentrate showing the abundant amount of sphalerite (dark grey) and its intimate association with galena (light grey). Pyrite ranks third in order of abundance with between 20% and 30% estimated as "apparently free" particles. Much of the pyrite may look free at this magnification, but actually contains locked galena. Photomicrographs No. 2, 3, and 4 are selected areas from this view at higher magnifications.

Photomicrograph No. 2
Magnification = 450x

Six out of ten pyrite particles in this view contain some galena locking. The remaining four do not appear to be locked with galena. Particle A, approximately 20 x 38 microns, was measured for particle size comparison.

Photomicrograph No. 3
Magnification = 700x

The large 43 x 58 micron pyrrhotite and the locked pyrrhotite-sphalerite particle in this view each contain some galena locking which may account for their floating into the lead concentrate.

Photomicrograph No. 4
Magnification - 1100x

This highly magnified view shows galena locking with most of the pyrite, pyrrhotite and sphalerite particles. The left-of-center particle is a locked transparent gangue-galena particle. Particle B measured approximately 7.2 x 16.2 microns.

M.P.D. Sheet Protector V-145
—V.P.D. Sheet Protector V-145—

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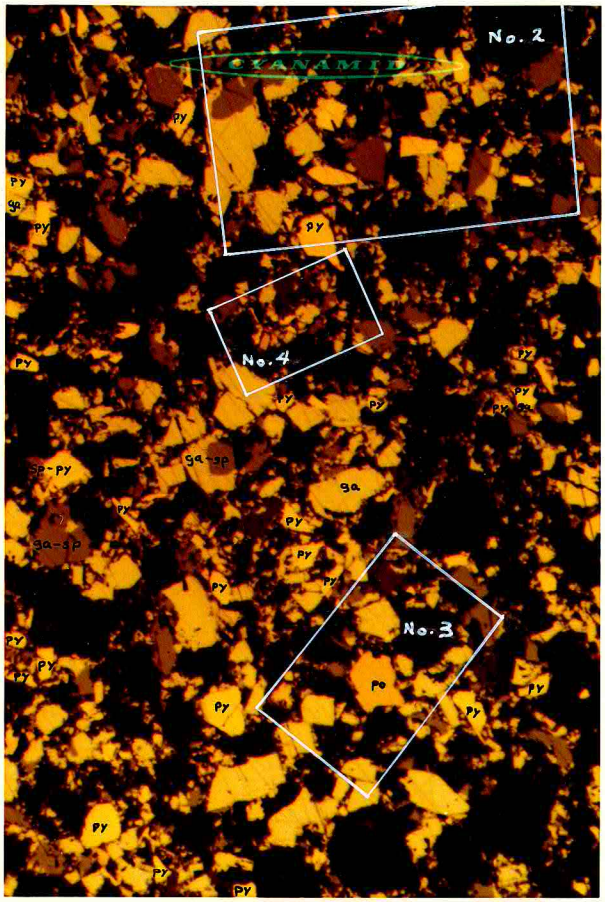

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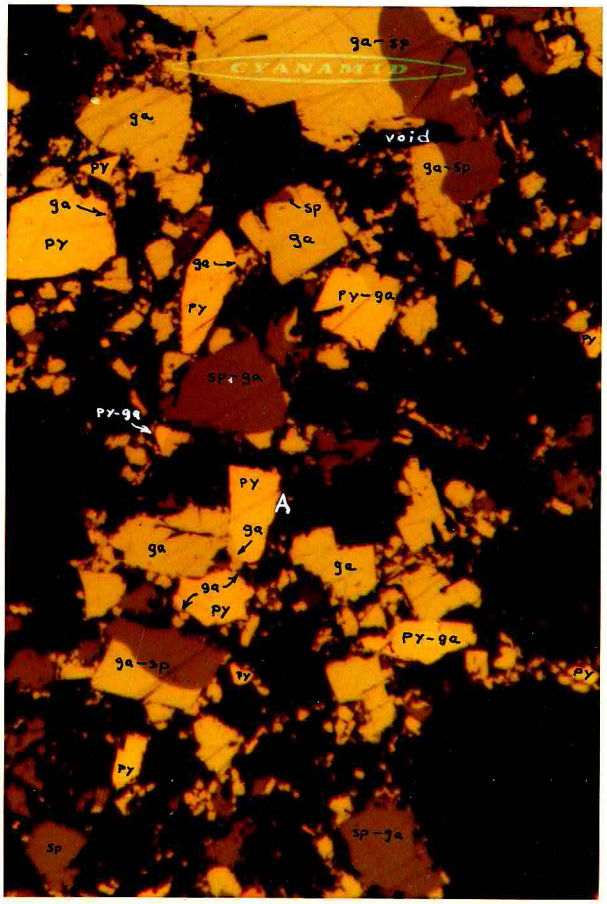

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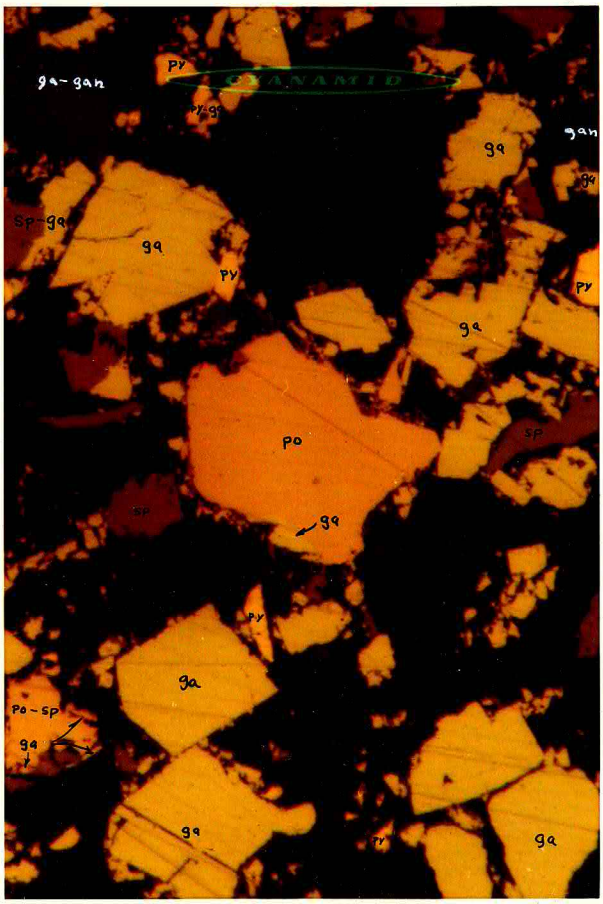

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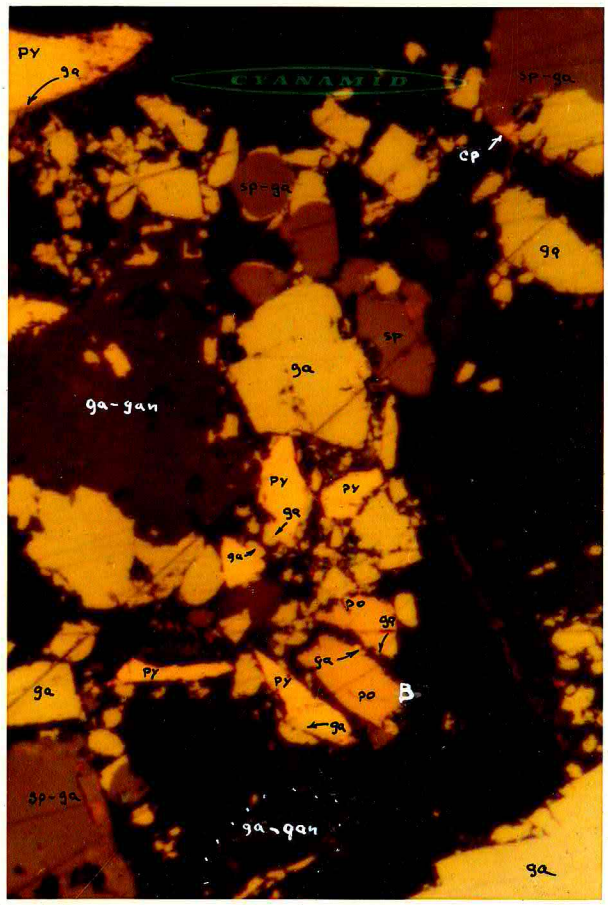

No. 4

M.P.D. Sheet Protector V-145

FINAL LEAD CONCENTRATE, +400 MESH FRACTION, 23.1% OF SAMPLE WEIGHT

Photomicrograph No. 5
Magnification = 175x

A typical view of the +400 mesh portion of the lead concentrate showing abundant sphalerite-galena locking, several pyrite-galena and pyrrhotite-galena locked particles, and six "apparently free" pyrite particles. Three typical types of transparent gangue-galena locking are also included in this view. The particles marked "X" are galena particles just beneath the polished plastic surface.

Photomicrograph No. 6
Magnification = 450x

This view shows typical chalcopyrite occurrence in the +400 mesh fraction of the lead concentrate, whereas the chalcopyrite in the extremely fine particle sizes was relatively free. Various degrees of pyrite-galena locking can be seen. The pyrite particle marked "C" measured approximately 31 x 50 microns.

—V.P.D. Sheet Protector V-145—

Photomicrograph No. 7
Magnification = 1100x

A highly magnified view of a complex locked particle of transparent gangue, sphalerite, pyrite, and galena. The maximum dimensions of this particle are approximately 54 x 81 microns.

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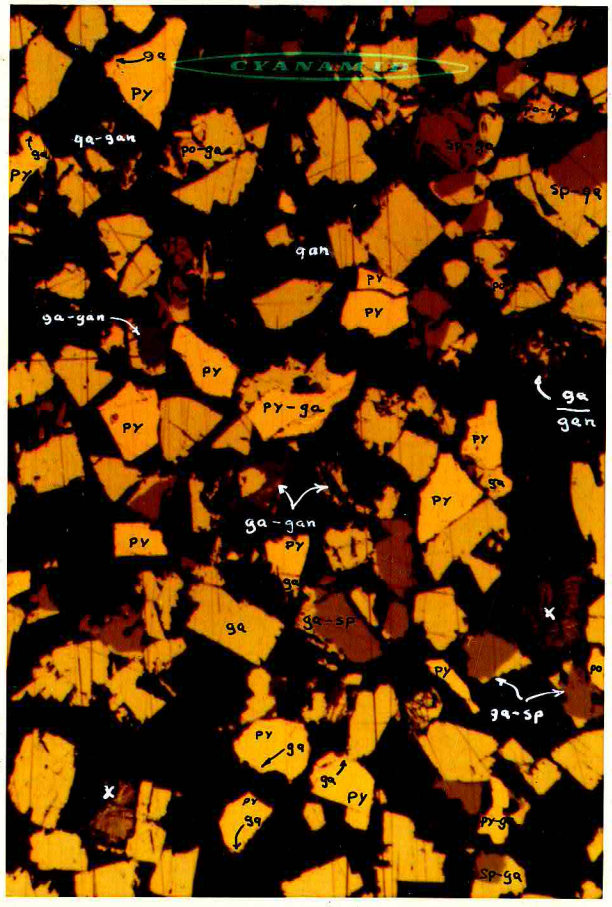

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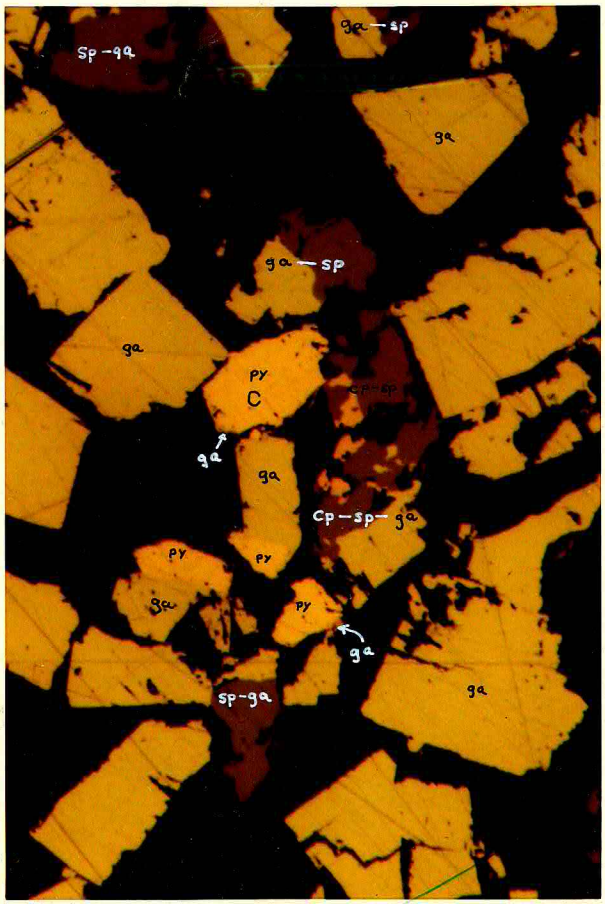

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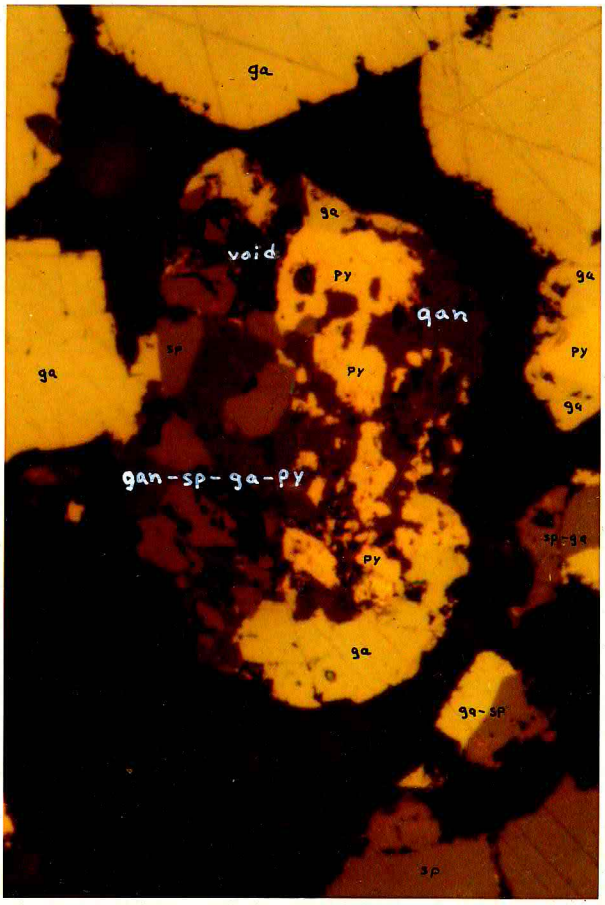

No.7