

PETROGRAPHIC REPORT
Zinc Rougher Scavenger Tails
Galmoy Mine Site

by
JAMESSTRONGMAN

Prepared for:

ARCON MINES LIMITED
Galmoy
Crosspatrick
Co. Killenny

Petrolab Limited

OldCowlin'sMill

Penhallick

CarnBrea

Redruth

Cornwall

TR15 3YR

petrolab@dial.pipex.com

James Strongman

23 October 2003

MINERALOGICAL REPORT

Zn Rougher Scavenger Tails

Client: Arcon Mines Limited
Date: 23 October 2003
Sample Source: Galmoy Mine Site
Sample type: Mill products
Analysis required: Mineralogy with special reference to the occurrence and distribution of zinc minerals

1 Samples

Three samples of zinc rougher scavenger tails were supplied. They are designated as follows.

Old Zinc Rougher Scavenger Tailings	+75 μm
New Zinc Rougher Scavenger Tailings	+75 μm
New Zinc Rougher Scavenger Tailings	-75 μm
Lead Rougher Concentrate	-53 μm

2 Methods of investigation

One 20 mm x 15 mm standard polished thin section was prepared from each sample. Sections were examined by conventional transmitted and reflected light polarising microscopy using a Nikon Labophot 2A research polarising microscope.

Modal analysis was conducted using a Prior 20 channel electromechanical point counter using stepping and traverse intervals of 0.25 mm. Five hundred points were counted from section, using combined transmitted and reflected light. A further 250 points were counted from the +75 μm samples to establish the size range and distribution of sphalerite locked in dolomite

Scanning electron microscopy/energy dispersive X-ray microanalysis was carried out at the Camborne School of Mines using a Joel GSM 840 scanning electron microscope fitted with a Link (Oxford Instruments) AN 10,000 thin window energy dispersive X-ray analyser. The purpose of this investigation was to establish if zinc was present in minerals other than sphalerite, for example smithsonite. No other zinc-bearing minerals were found.

Zn Rougher Scavenger Tails

3 Mineralogy3.1 Old Zinc Rougher Scavenger Tailings + 75 μm

The product is well graded. The approximate size range is between 75 μm and 500 μm . There are few grains, with high aspect ratio, up to 800 μm long.

<i>Sphalerite</i>	Liberated	0.5%	Locked with	Pyrite	0.9%
				Carbonate	1.2%
				Galena	trace
				Total Sphalerite	2.6%
Grain Size	Liberated	< 75 μm – approx. 200 μm			
	Locked	> 10 μm – approx. 100 μm			
Description	Most sphalerite is locked with dolomite and pyrite. Sphalerite – dolomite locked particles show a range of textures, from coarse, simple locks, up to 100 μm in size, to complex, fine replacements on scales of < 10 μm . Most locks are coarse and simple, > 50 μm . Sphalerite – pyrite locked particles also show a range of locking textures, from coarse and simple (up to 100 μm) to fine, complex intergrowths. Approximately 20% of sphalerite is apparently liberated. Its size range is from about 75 μm to 200 μm .				
<i>Dolomite</i>				Total	74.2%
				% of grains containing no sphalerite	85.6%
				% of grains containing sphalerite	14.4%
Grain Size	75 μm – 800 μm				
Description	Dolomite makes up almost 75% of the sample and is the only mineral that occurs as grains > 400 μm in size. Most dolomite is completely liberated. Nearly 15% of dolomite particles contain inclusions of sphalerite; the average size of sphalerite inclusions is about 50 μm . Thus, about 1.2% of sphalerite is contained in nearly 15% of the dolomite grains.				
<i>Pyrite</i>				Total	23.1%
Grain Size	75 μm – 400 μm				
Description	Pyrite occurs as angular liberated grains in the 75 μm to 400 μm size range. Average particle size is about 200 μm . Pyrite also occurs as locked particles with sphalerite though pyrite – dolomite locks are rare.				
<i>Iron Oxides</i>				Total	0.1%
Grain Size	< 50 μm – approx. 400 μm				
Description	Granular iron oxide generally occurs as liberated grains up to 400 μm in diameter. It often shows colloform textures and occasionally contains relict inclusions of pyrite.				

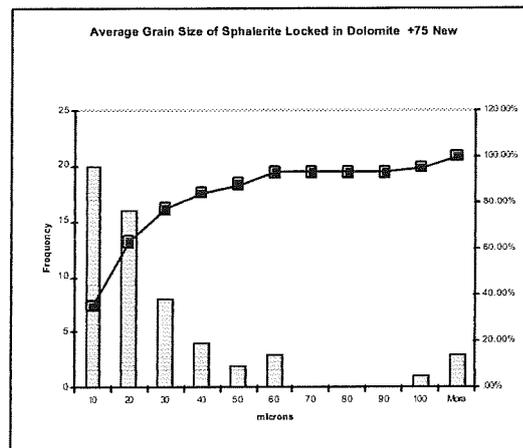
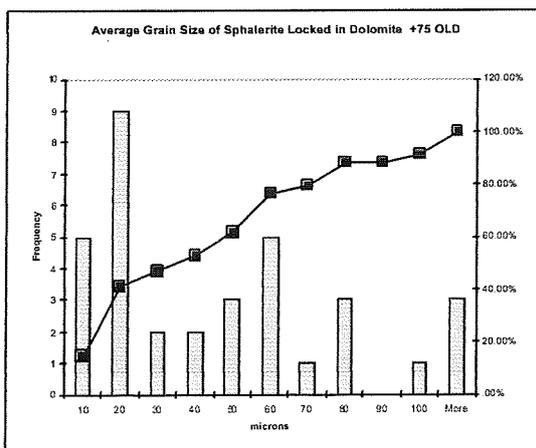
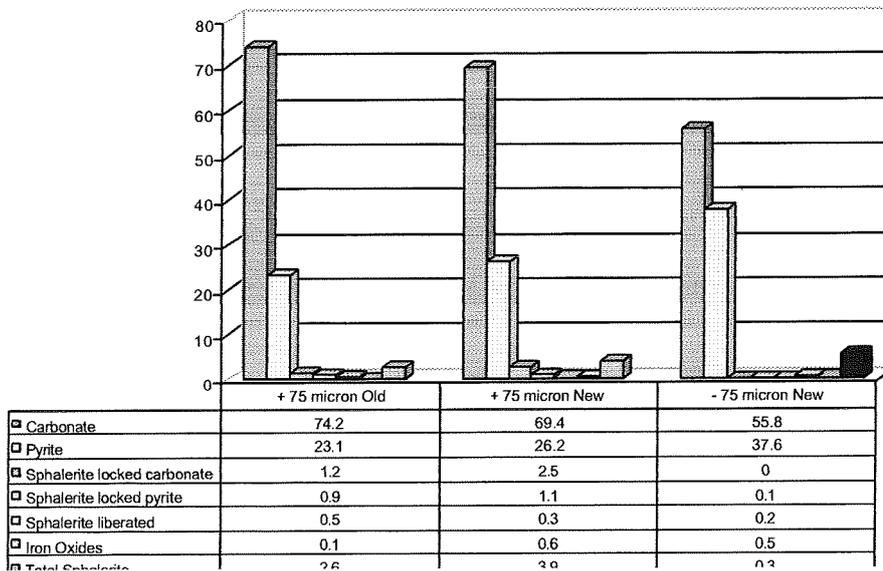
Zn Rougher Scavenger Tails

2. The only significant variations between the two samples is that the New Zinc Rougher Scavenger Tailings has more sphalerite locked with dolomite and it contains more iron oxide.

3. The increase in sphalerite – dolomite locked particles appears to be related to the decrease in average locking size of sphalerite in dolomite. The decrease presumably reflects textural variations in the ore.

4. Almost all the sphalerite in both products is locked. There is slightly less liberated sphalerite in the New Zinc Rougher Scavenger Tailings. This reflects the increase of fine sphalerite – dolomite locks *decreasing* the overall amount of liberation.

Modal Analysis: Zn Rougher Scavenger Tails



Zn Rougher Scavenger Tails

3.2 New Zinc Rougher Scavenger Tailings +75 µm

The product is well-graded. The approximate size range is from 75 µm to 500 µm. There are few grains with high aspect ratios up to 800 µm long.

<i>Sphalerite</i>	Liberated	0.3%	Locked with	Pyrite	1.1%
				Dolomite	2.5%
				Galena	trace
			Total Sphalerite		3.9%
Grain Size	Liberated	< 75 µm – approx. 200 µm			
	Locked	> 10 µm – approx. 100 µm			
Description	Most sphalerite is locked with dolomite and pyrite. Sphalerite – dolomite locks show a range textures, from coarse (up to 100 µm) to fine replacement textures on scales of < 10 µm. Most locks are fine and complex. Average locking size is about 20 µm. Sphalerite – pyrite locked particles also have a range of locking texture. The distribution of locks is approximately uniform. Average locking size is about 40 µm. Approximately 8% of sphalerite is apparently liberated. Its approximate size range is from 75 µm to 200 µm.				
<i>Dolomite</i>			Total	69.4%	
		% of grains containing no sphalerite		77.6%	
		% of grains containing sphalerite		22.4%	
Grain Size	75 µm – approx. 800 µm				
Description	Dolomite makes up nearly 70% of the sample. It is the only mineral that forms grains > 400 µm in size. Most dolomite is completely liberated. Just over 20% of dolomite grains contain inclusions of sphalerite. Average inclusion size is about 20 µm in size.				
<i>Pyrite</i>			Total	26.1%	
Grain Size	< 1 µm – approx. 480 µm				
Description	Pyrite occurs as angular liberated grains between about 75 µm and 400 µm in size. Average size is approximately 200 µm. It also forms locked particles with sphalerite. Locks with dolomite are rare.				
<i>Iron Oxides</i>			Total	0.6%	
Grain Size	< 1 µm – approx. 400 µm				
Description	Iron oxide generally occurs as liberated grains up to 400 µm in size. It often shows colloform texture. Much iron oxide contains relict inclusions of pyrite, ranging from nearly intact crystals to irregular, strongly corroded grains				

3.3 Summary

1. Both products have similar mineralogy, particle size distribution and composition. The most abundant mineral is dolomite.

Zn Rougher Scavenger Tails

3.4 New Zinc Rougher Scavenger Tailings –75 μm

The product is well-graded. The approximate size range is from < 5 μm to about 75 μm . There are grains with few high aspect ratios up to 100 μm long. Particles < 5 μm in size cannot be identified with confidence under the optical microscope. This accounts for the deficit of 5.8% in the modal analysis total.

<i>Sphalerite</i>	Liberated	0.2%	Locked with	Pyrite	0.1%
				Dolomite	trace
				Galena	trace
				Total Sphalerite	0.3%
Grain Size	Liberated	< 5 μm – approx. 75 μm			
	Locked	5 μm – approx. 60 μm			
Description	Sphalerite is rare. Most is liberated or occurs in simple, single boundary locks with pyrite. The high degree of liberation and simple locking is attributed to the fine grain size.				
<i>Dolomite</i>				Total	55.8%
Grain Size	1 μm – approx. 80 μm				
Description	Dolomite makes up over half of the sample. It occurs mainly as liberated grains. SEM/EDMA analysis demonstrated that no smithsonite or other carbonates are present.				
<i>Pyrite</i>				Total	37.1%
Grain Size	< 1 μm – approx. 75 μm				
Description	Pyrite occurs as mainly as angular liberated grains. There are a few simple locks with sphalerite. Locks with dolomite are very rare.				
<i>Iron Oxides</i>				Total	0.5%
Grain Size	< 1 μm – approx. 70 μm				
Description	Iron oxide generally occurs as liberated grains < 70 μm in size. Most have colloform texture and many contain corroded cores of pyrite. Intensity of oxidation of pyrite is very variable.				

3.5 Summary

1. Liberation is very good. Sphalerite is present only in trace amounts.
2. The very fine-grained particles (< 5 μm) probably have a similar compositional range to the remainder of the sample.

Zn Rougher Scavenger Tails

3.6 Lead Rougher Concentrate –53 µm

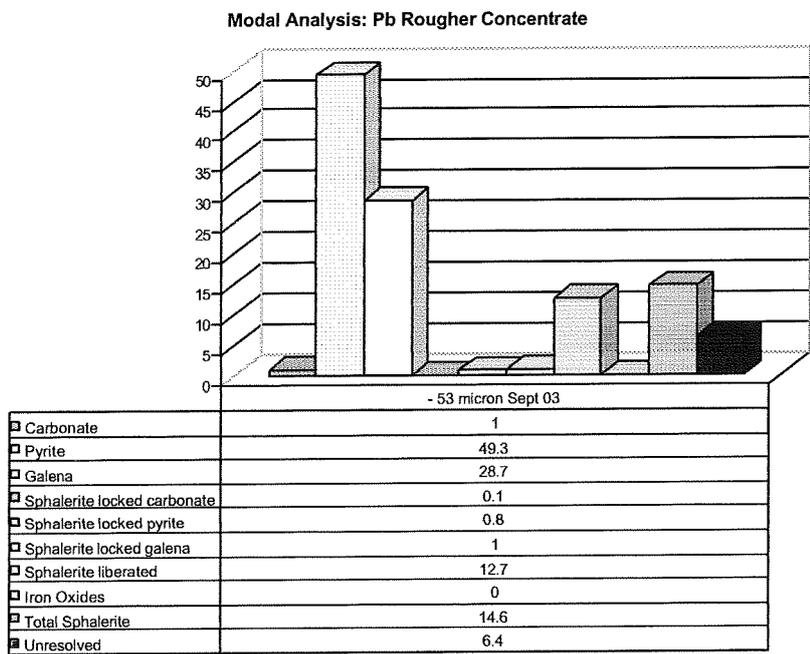
It is well-graded. The approximate size range is from < 5 µm to about 60 µm. There are a few grains with high aspect ratios up to 100 µm long. Particles < 5 µm in size cannot be identified with confidence under the optical microscope. This accounts for the deficit of 6.2% in the modal analysis total.

<i>Sphalerite</i>	Liberated	12.7%	Locked with	Pyrite	0.8%
				Carbonate	0.1%
				Galena	1.0%
				Total Sphalerite	14.6%
Grain Size	Liberated	< 5 µm – approx. 55 µm			
	Locked	5 µm – approx. 50 µm			
Description	Sphalerite is about 85% liberated. The most common locking phase is galena. Locked particles usually have simple, straight or slightly sutured grain boundaries. Sphalerite is also locked with pyrite. There are a range of textures from complex, fine inclusions (< 10 µm) to coarser simple locks up to 40 µm in size.				
<i>Dolomite</i>			Total	1.0%	
Grain Size	1 µm – approx. 50 µm				
Description	Dolomite occurs in minor amounts. Most is apparently liberated. A few grains contain very fine, dispersed inclusions of galena, up to 10 µm in size.				
<i>Pyrite</i>			Total	49.3%	
Grain Size	< 1 µm – approx. 60 µm				
Description	Pyrite occurs mainly as apparently liberated grains. There are a few pyrite – galena locked particles and simple locks with sphalerite. Locks with dolomite are relatively rare. Pyrite – dolomite locks are very rare.				
<i>Galena</i>			Total	28.7%	
Grain Size	< 1 µm – approx. 50 µm				
Description	Galena is almost completely liberated. The most common locks are with pyrite. Liberated galena particles are strongly agglutinated into rounded "clumps". It is uncertain if this occurred during processing or if it is a result of sample preparation.				
<i>Iron Oxides</i>			Total	0.5%	
Grain Size	< 1 µm - approx. 50 µm				
Description	Iron oxide generally occurs as liberated grains up to 60 µm in size. They often have colloform texture. Many contain corroded cores of pyrite.				

Zn Rougher Scavenger Tails

3.7 Summary

1. The sample shows excellent liberation.
2. The sample has high sphalerite content. The reasons for sphalerite reporting to the Pb concentrate are unclear. It is about 85% liberated. Entrainment is a probable explanation. The same mechanism may account for the large amount of apparently liberated pyrite in the product.
3. The very fine-grained particles (< 5 µm) probably have a similar compositional range to the remainder of the sample.



Zn Rougher Scavenger Tails

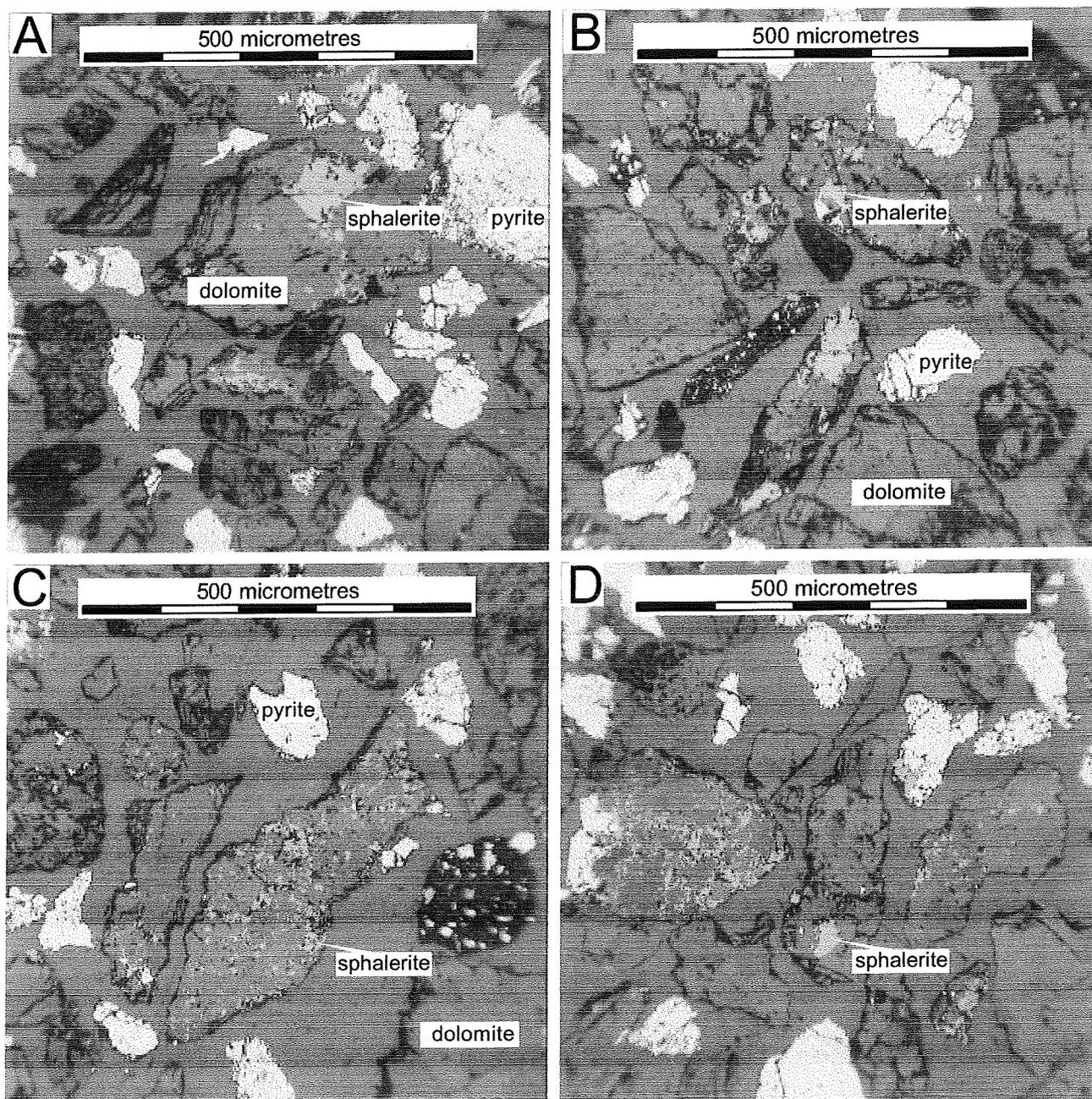


Plate 1. Comparison of typical locking textures between the Old and New Zinc Rougher Scavenger Tailings.

A, B Zn Rougher Scavenger Tails +75 mm Old. Typical coarse sphalerite - dolomite locked particle. The images also show liberated dolomite and pyrite.

C, D Zn Rougher Scavenger Tails +75 mm New. Fine-scale locking between sphalerite and dolomite.

Zn Rougher Scavenger Tails

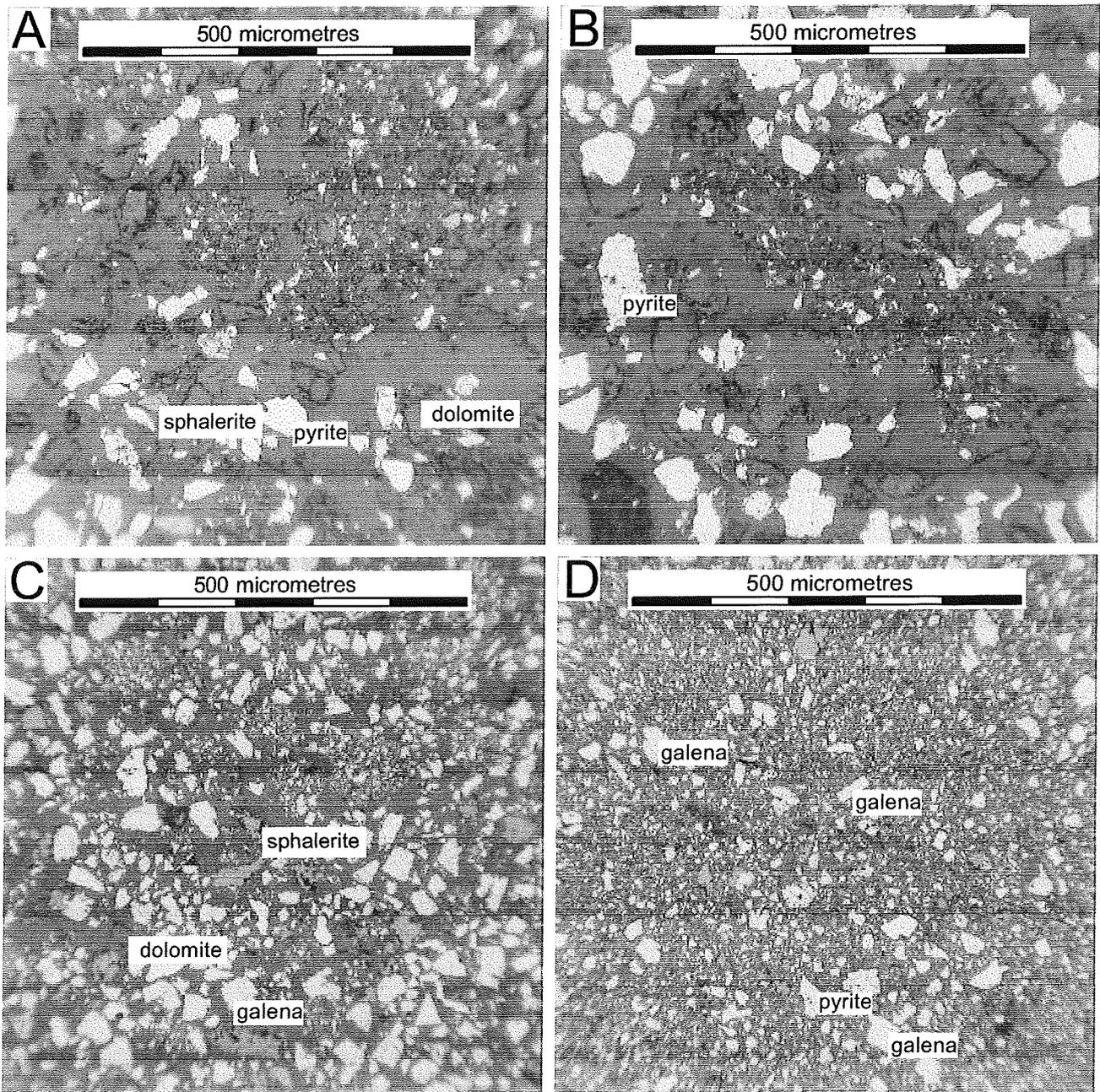


Plate 2.

A, B Zn Rougher Scavenger Tails - 75 m m. General view showing the high degree of liberation of all minerals.

C, D Pb Cleaner Concentrate - 53 mm. General views showing the high degree of liberation of all minerals. The concentrate contains a relatively large amount of pyrite. Both photos are taken at the same magnification and show how material of similar sizes tends to clump together.