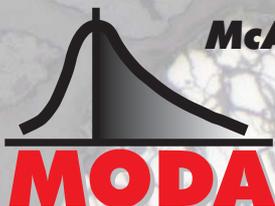


ALS AMMTEC BURNIE

***TAMAR GOLD TAILINGS
GRAVITY CONCENTRATE
Mineralogy***

November, 2011



McArthur Ore Deposit Assessments Pty Ltd

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Tamar Gold

Tailings Gravity Concentrate Mineralogy

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Method

One sample of a laboratory gravity concentrate from the Tamar Gold Tailings Project was submitted by John Glen (Burnie Research Laboratory) for mineralogical assessment. The sample was unsized, but the grains are in the 53-300µm range. The sample was mounted as a polished thin section by Australian Petrographics (Queanbeyan, NSW).

The sample was submitted to McKnight Mineralogy (Ballarat, VIC) for Quantitative X-Ray Diffraction Analysis (QXRD).

The standard MODA quantitative technique was adopted.

400 grains were selected at random and the area % of each mineral present was visually estimated. The minerals logged were: *pyrite* (Py), *arsenopyrite* (As), *chalcopyrite* (Cp), *gold* (Au), *sphalerite+galena* (SpGn), *magnetite* (Mt), *Fe oxides/hydroxides* (Feox) and *gangue* (*quartz, silicates, carbonates*, Ga).

The textural style of each grain was recorded to allow production of a schematic grain map.

The standard mineral liberation and association parameters were calculated and presented in summary spreadsheet form.

The entire slide was scanned in detail in 1mm slices and all gold occurrences were logged for: X/Y location, grain size and minerals in contact with the gold.

General photomicrographs were taken, along with several high magnification grain images to illustrate the arsenopyrite oxidation textures and occurrences of free gold.

Results

Composition - QXRD

McKnight Mineralogy has reported the following composition:

Phase	Weight%
Arsenopyrite	63.1
Cassiterite?	0.8
Goethite	1.2
Hematite	0.5
Magnetite	trace
Muscovite	5.2
Pyrite	2.1
Quartz	23.1
Scorodite#	0.9
Siderite	3.1

FeAsO₄.2H₂O

Composition – MODA Optical Microscopy

In order of predominance, the following minerals were identified:

- Gangue [mainly *quartz, silicates, carbonates*]
- *Arsenopyrite* FeAsS
- *Pyrite* FeS₂ [including arsenical varieties]
- *Fe/As oxides and hydroxides* [poorly crystallised oxidation products]
- *Magnetite* Fe₃O₄
- *Hematite* Fe₂O₃
- *Galena* PbS [and probable associated *cerussite*]
- *Chalcopyrite* CuFeS₂
- *Sphalerite* (Zn,Fe)S
- *Rutile* TiO₂
- *Pyrrhotite* Fe_{1-x}S
- Slag
- *Electrum* (Au,Ag)

Tamar Gold Gravity Conc composition vol%

Py	As	Cp	Sp+Gn	Mt	Feox	Ga
13.3	20.4	0.01	0.05	0.46	13.0	52.8

Py=pyrite, As=arsenopyrite, Cp=chalcopyrite, Sp+Gn=sphalerite+galena, Mt-magnetite, Feox=Fe oxides, Ga=gangue

Sulphide Textural Features

- Virtually all of the *arsenopyrite* grains are partially oxidised with rims of, and/or cracks filled with, poorly crystallised Fe/As oxide/hydroxides
- The *pyrite* and *pyrrhotite* grains are distinctly less oxidised
- Only rarely are *pyrite* and *arsenopyrite* observed together in the one grain
- *Galena* is always strongly oxidised, unless occluded within *arsenopyrite*

Gold Scan

49 *gold* grains were logged after scanning the entire slide in detail. Of these, 30 *gold* grains were free, but some are partially coated with ferruginous material. The remaining 19 grains are hosted by *arsenopyrite*. In terms of areal extent, 97.5% of the *gold* is free, and only 2.5% is hosted by *arsenopyrite*.

The free *gold* grains vary in size (maximum dimension) from 400µm to 10µm, averaging 150µm. The *gold* grains hosted by *arsenopyrite* vary from 100µm to 5µm, averaging 26µm.

79% of the surfaces of the free *gold* grains are clean, and 21% are coated with *Fe/As oxides/hydroxides*.

Further Investigative Work

The strong association of visible *gold* with *arsenopyrite* suggests the *arsenopyrite* will contain significant amounts of sub-microscopic “refractory” *gold*. It is strongly recommended that a small programme of Laser Ablation Induced Coupled Plasma Mass Spectrometry (LA-ICPMS) be undertaken to determine the gold (and silver) content of the *arsenopyrite* and *pyrite*. MODA can organise this through CODES at the University of Tasmania. Approximate costs would be:

Polished block preparation: \$60

15 *arsenopyrite*, 5 *pyrite* microanalyses Au,Ag,As,Se,Co,Ni,Mn,Cu,Pb,Zn @\$45: \$900

2 hours mineralogist time to assess and summarise results: \$250

TOTAL (before GST) \$1210

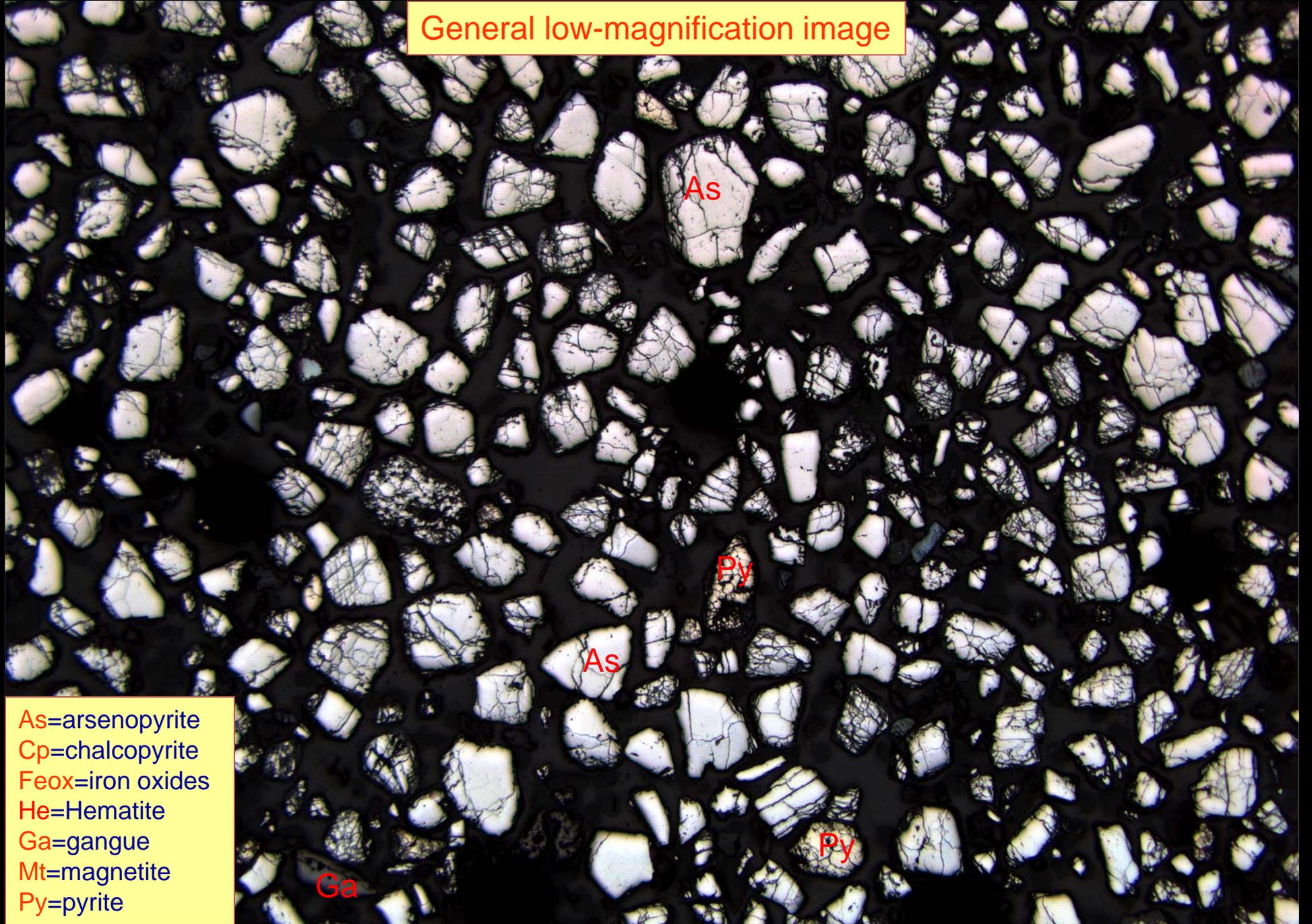
G.J.McArthur PhD FAusIMM MMICA MSEG

Principal Mineralogist

3.11.11



General low-magnification image



As=arsenopyrite
Cp=chalcopyrite
Feox=iron oxides
He=Hematite
Ga=gangue
Mt=magnetite
Py=pyrite

Image width 8.2mm

Reflected Light

Tamar Gold Tailings Gravity Conc

General medium-magnification image

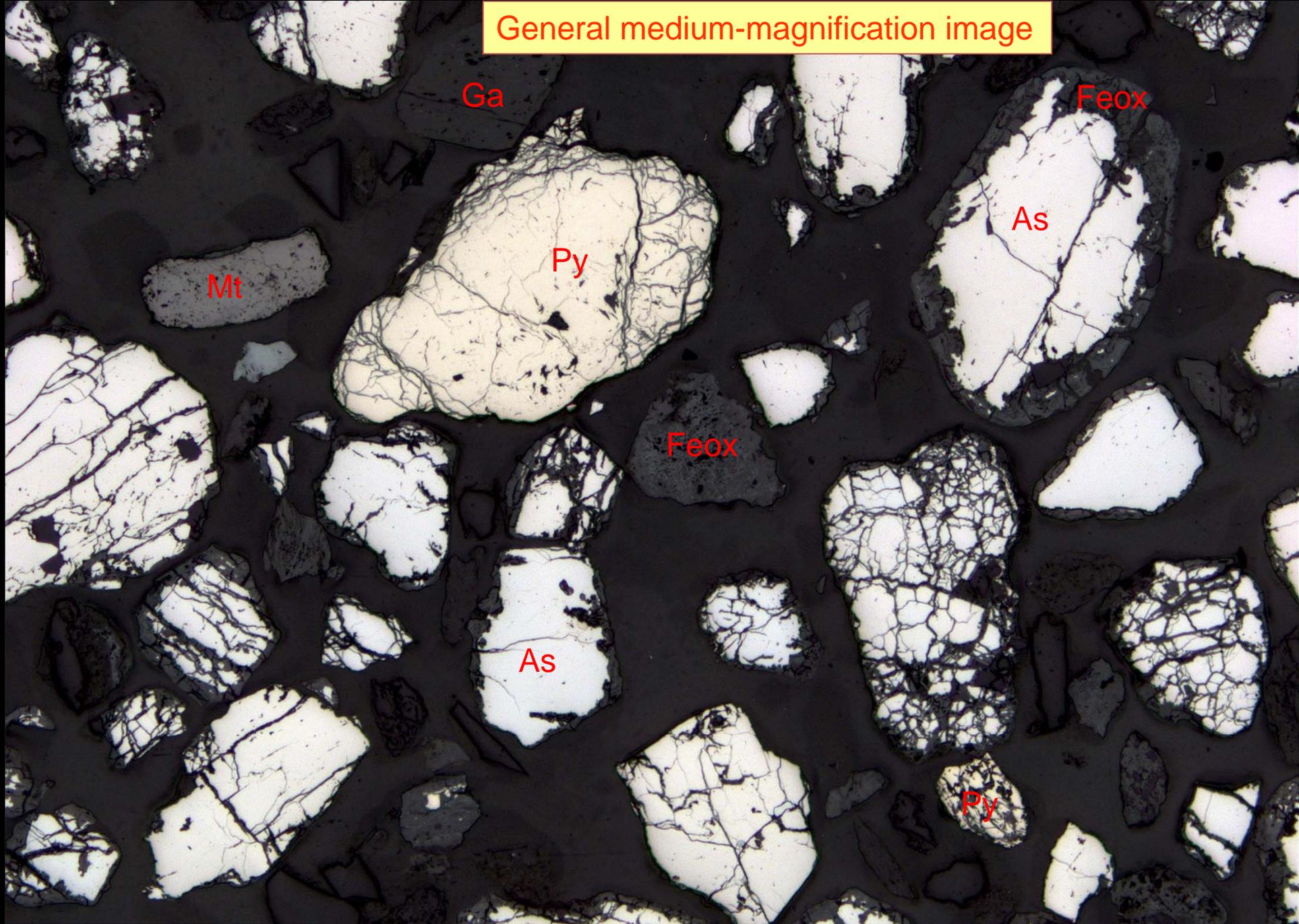
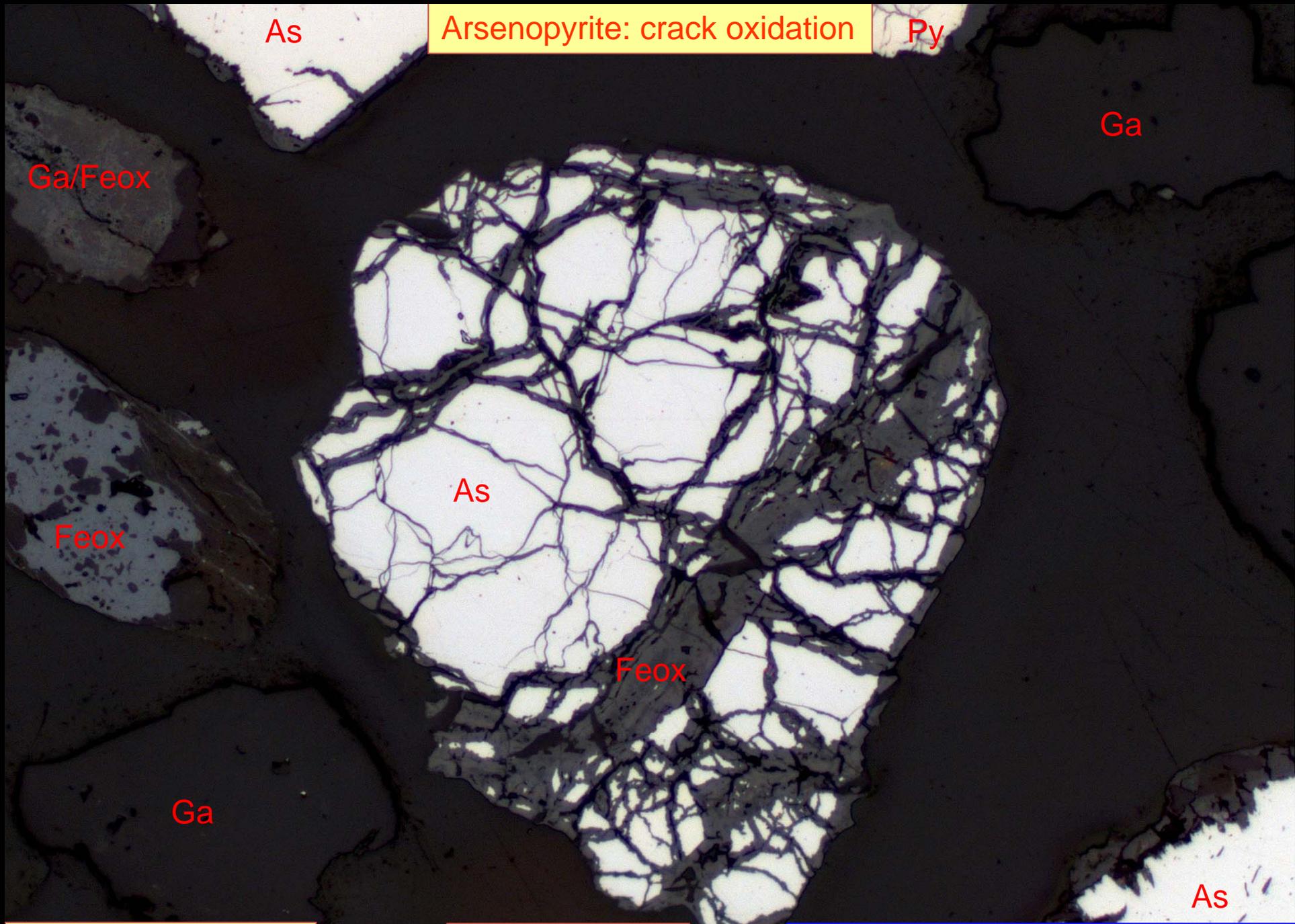


Image width 2.1mm

Reflected Light

Tamar Gold Tailings Gravity Conc



As

Arsenopyrite: crack oxidation

Py

Ga

Ga/Feox

As

Feox

Feox

Ga

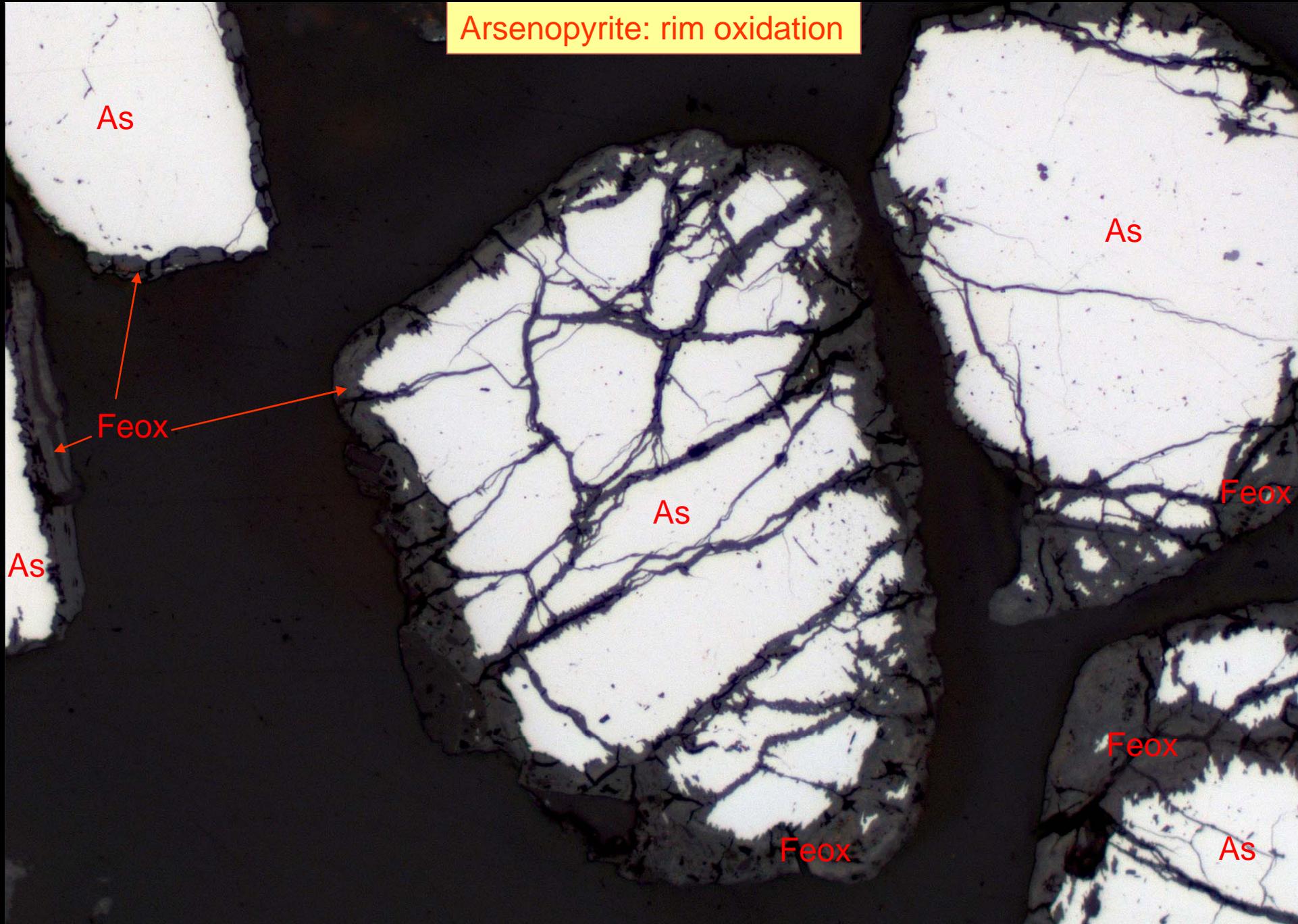
As

Image width 515µm

Reflected Light

Tamar Gold Tailings Gravity Conc

Arsenopyrite: rim oxidation



As

As

Feox

As

Feox

As

Feox

Feox

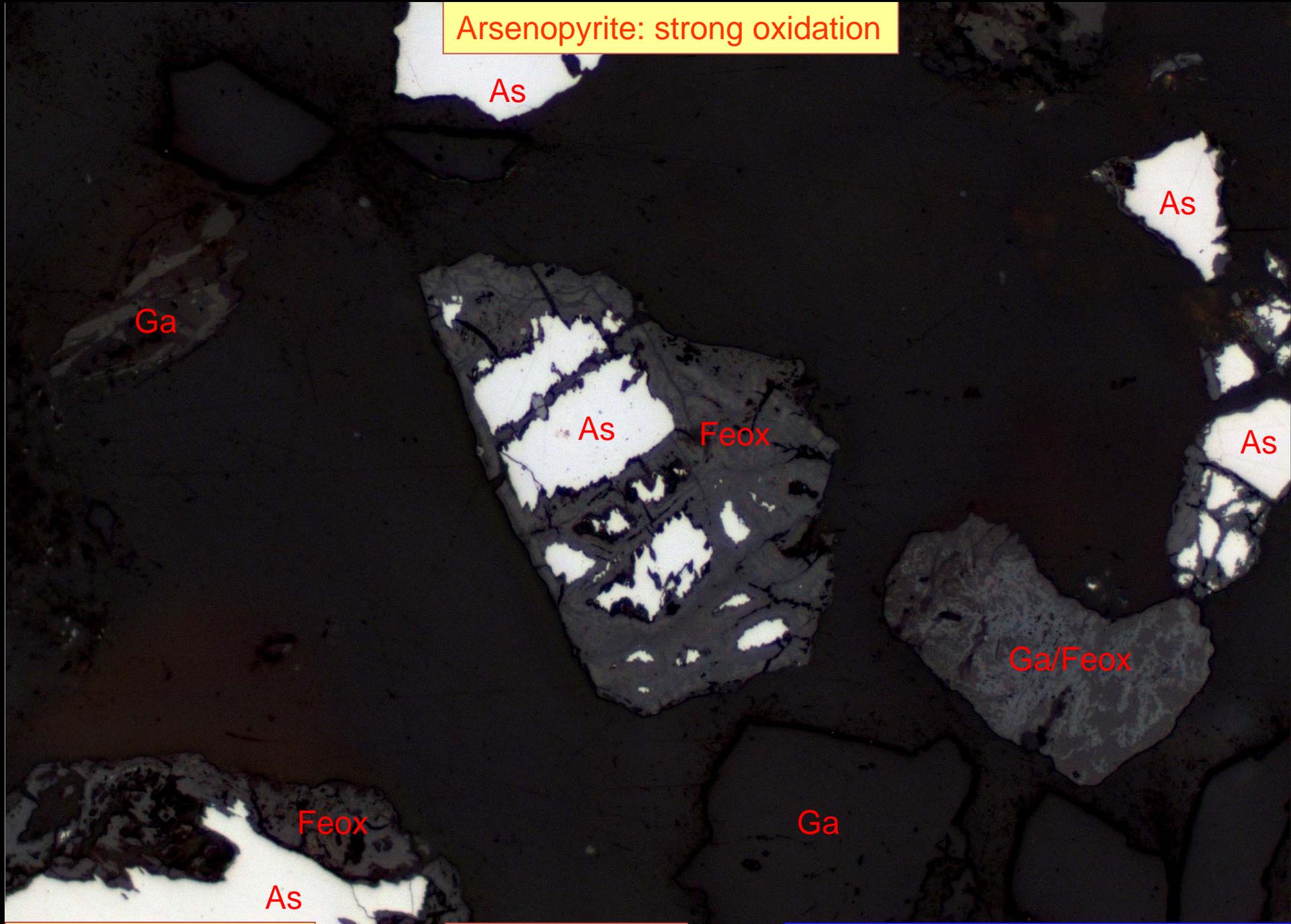
As

Image width 515µm

Reflected Light

Tamar Gold Tailings Gravity Conc

Arsenopyrite: strong oxidation



Ga

As

As

As

Feox

As

Ga/Feox

Feox

Ga

As

Image width 515µm

Reflected Light

Tamar Gold Tailings Gravity Conc

Arsenopyrite+galena

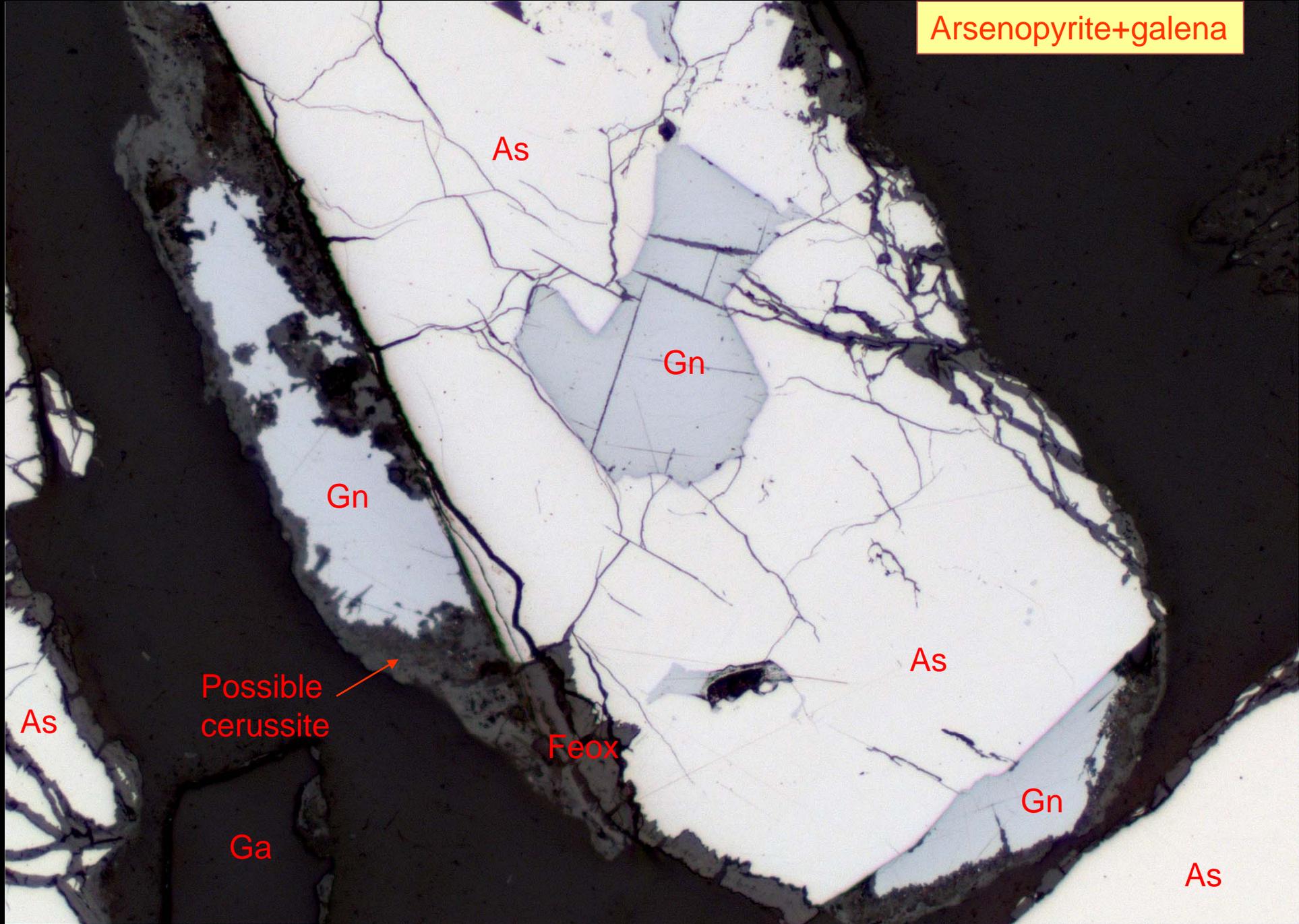
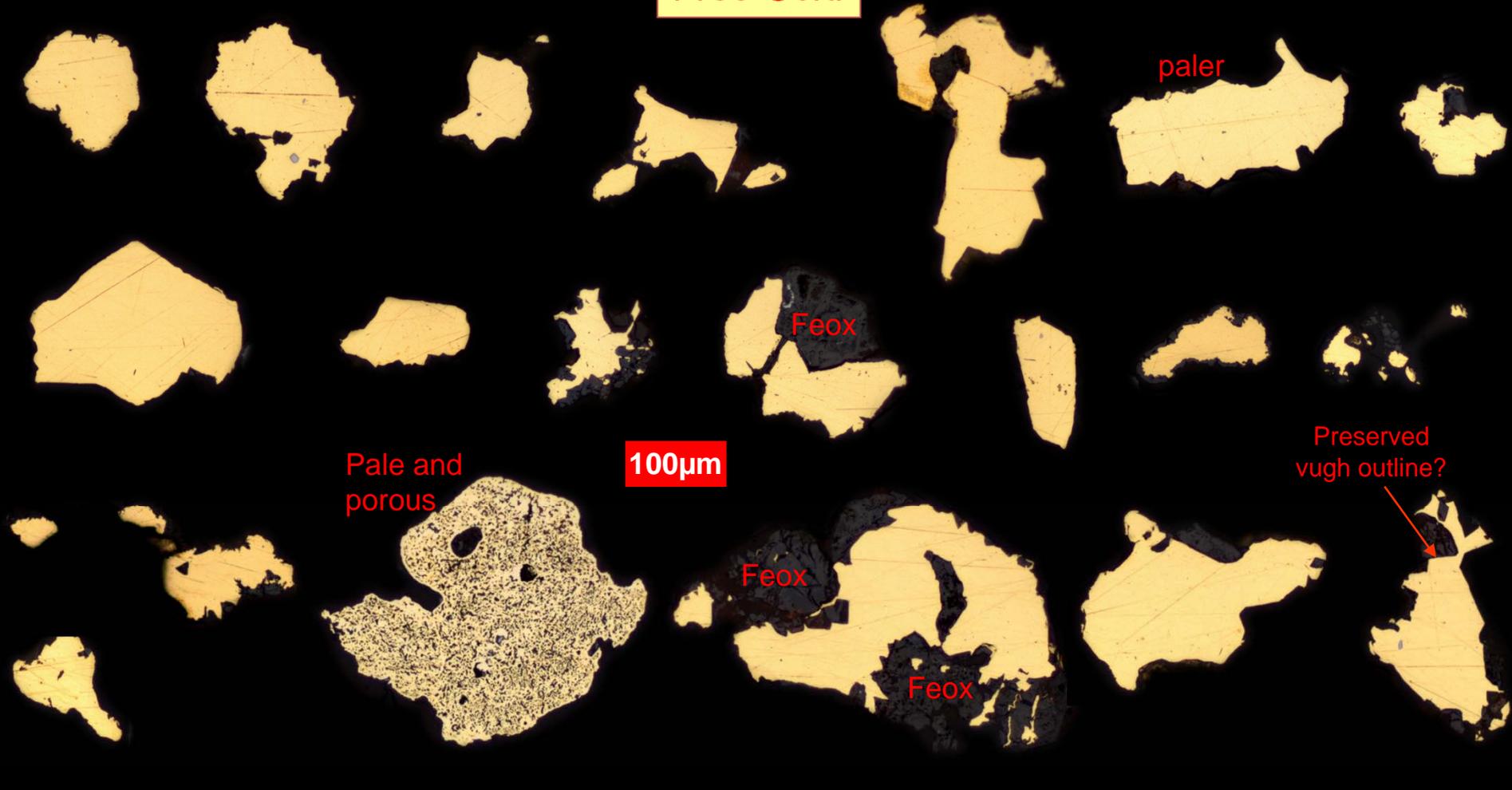


Image width 515µm

Reflected Light

Tamar Gold Tailings Gravity Conc

Free Gold



paler

Feox

100µm

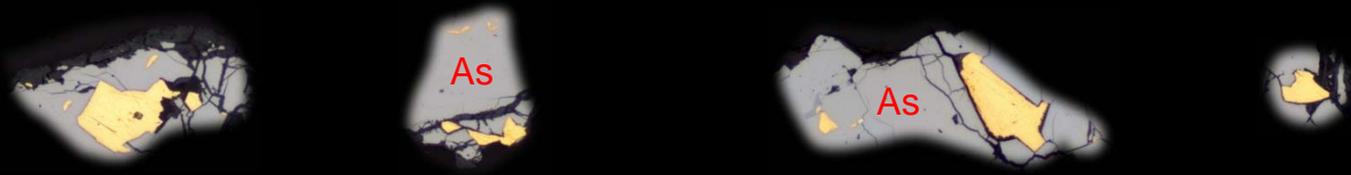
Pale and porous

Feox

Feox

Preserved vugh outline?

Gold in arsenopyrite



As

As

Reflected Light

Tamar Gold Tailings Gravity Conc

PARTICLE MINERALOGY REPORT
Tamar Gold Gravity Conc
November 2011

-300µm+53µm	25 % by weight
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Average composition - all grains

Py	As	Cp	Au	SpGn	Mt	Feox	Ga	n
13.3	20.4	0.01		0.05	0.46	13.0	52.8	400
84	69	3		6	62	25	92	

ASSAYS

	SG	Cu	Pb	Zn	Au	As	Fe
Calc'd	3.83	0.00	0.01	0.02		14.2	27.4
Actual							

COMPOSITE PROPORTIONS

	Py	As	Cp	Au	Mt	Feox	Ga	
Mono	19	2	0	0	54	8	79	
Binary	74	91	0	0	46	88	20	
Ternary	5	6	100	100	0	4	1	
Quat.y+	1	0	0	0	0	0	0	
# Grains	16.0	29.0	0.3	0.3	0.8	53.3	57.0	1.57

BINARY ASSOCIATION MATRIX

	Py	As	Cp	Au	Mt	Feox	Ga
Py		0	0	0	0	91	7
As	0		0	0	0	100	0
Cp	0	0		0	0	0	0
Au	0	0	0		0	0	0
Mt	0	0	0	0		0	100
Feox	18	67	0	0	0		15
Ga	1	0	0	0	3	96	

TOTAL ASSOCIATION MATRIX

	Py	As	Cp	Au	Mt	Feox	Ga
Py		2	0	0	0	75	8
As	1		1	1	0	98	3
Cp	0	100		0	0	100	0
Au	0	100	0		0	100	0
Mt	0	0	0	0		0	46
Feox	17	63	0	0	0		17
Ga	1	0	0	0	1	20	

of all

DISTRIBUTION MATRIX

	Free	Binary						Tern	Quat
	Py	As	Cp	Au	Mt	Feox	Ga		
Py	19	0	0	0	0	68	5	5	1
As	2	0	0	0	0	91	0	6	0
Cp	0	0	0	0	0	0	0	100	0
Au	0	0	0	0	0	0	0	100	0
Mt	54	0	0	0	0	0	46	0	0
Feox	8	15	59	0	0	0	13	4	0
Ga	79	0	0	0	0	1	19	1	0

ALS Ammttec - Tamar Gold Testwork

**Tamar Gold Gravity
Conc**

-300 μ m+53 μ m

November 2011

