

## **MINERALOGY - APPENDIX 1**

As a preliminary to metallurgical testing bulk samples were taken by backhoe from the Grieves area by Zinifex under a Joint Venture Agreement. The samples were sealed in plastic containers and refrigerated to inhibit oxidation which might lead to spurious flotation results. The sample locations appear below together with some descriptions by Gerald Purvis who supervised the sampling.

Mineralogical investigations were conducted at the University of Ballarat including XRD and SEM work. Their results also appear below. The results are encouraging as regards the sphalerite properties e.g. Grainsize and surprising to both the geologist on location and generally as regards the matrix composition as some is organic rather than a clay and no previous descriptions have mentioned this.

## Sample Locations



J . G . P U R V I S & A S S O C I A T E S P T Y . L I M I T E D  
C O N S U L T I N G A N D C O N T R A C T G E O L O G I S T S

A . B . N . 8 0 0 0 9 5 4 5 5 9 1

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Memo to: Kim Lai, Ammtec Laboratories, Burnie

From: Gerald Purvis

Date: 5<sup>th</sup> January 2006

Re: Greives Met Samples

Kim,

Yesterday I delivered to you five pit samples from the Greives Zn-in-clay deposit. Three samples were taken from the southern deposit block and two from the northern block – they are separated by a cross fault. The samples are (with grade of original air-core hole at the same site):

#### SOUTHERN BLOCK:

PIT 368 (2.67% Zn)

PIT 181 (7.81% Zn, 2.2% Pb)

PIT 170 (3.09% Zn, 1.88% Pb)

#### NORTHERN BLOCK:

PIT 115 (9.32% Zn)

PIT 264 (3.58% Zn)

The grades are a guide only as the pits may be up to 10m from the air core hole.

From each pit you now have:

# One 3-5kg ASSAY SAMPLE in a plastic bag.

# Six plastic pails (each 20-30kg) labelled SAMPLE 1 (2 pails), SAMPLE 2 (2 pails) and SAMPLE 3 (2 pails).

# Three 2 litre LIQUOR SAMPLES from Pits 368, 181 and 170.

# One grab 0.5kg rock sample from Pit 264 for mineralogical identification of the black vein material.

From each pit the material in the assay sample and each of the pails is the same.

We request you do your initial mineralogical, assay and other testwork on all five assay samples, commencing with the higher-grade Pit 181 and Pit 115. Even if this initial work produces uniformly poor results we will do floatation tests on at least one Sample 1 – again, probably from Pit 181 or 115.

The material is nothing like we expected. Although it is clayey it is not a wet surficial clay layer and is better described as rotten limestone – in most pits relict bedding and veining (after carbonate) could still be discerned. In each case it has the consistency (and appearance) of lignite. The material varies but is generally fairly firm and lumpy, only slightly damp and dark brown in colour with common black partings. I suspect the colouration is due to manganese oxides. In Pits 115 and 264 we couldn't sample any liquor as the material was too dry. I doubt there is any carbonate left. I could detect no evidence of sulphides either visually or by smell. The material was usually lightweight but in Pit 170 it was noticeably heavier.

Regards,

Gerald Purvis.

# QXRD and SEM Analysis of Samples Submitted by Burnie Research Laboratory



UNIVERSITY OF BALLARAT

**Attn:** Kim Lai

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17/01/06

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## **Samples Submitted**

The samples are six mineral pulps labelled:

**#9519 - 9524**

## **XRD ID**

The following phases have been identified in the samples by computer aided search of the 2005 ICCD PDF4 minerals database:

**Quartz**

**Muscovite**

**Pyrite**

**Sphalerite (+ Wurtzite?)**

**Galena**

**Chlorite**

**Dolomite**

**Anhydrite**

**Marcasite?**

**Also present in the samples in varying proportions is a dark coloured organic matter rich amorphous substance. This material looks like a “desiccated gel” and is the major component of several of the samples submitted. It is the host to much of the sulphide phases present in the samples, particularly the sphalerite.**

**In order to obtain meaningful quantitative XRD results the powdered samples have been rerun after the addition of a known (10 wt%) quantity of pure alumina, ie spiking the samples, allowing an estimate of the proportion of amorphous phase present in each sample.**

**A cursory SEM examination has been made of two polished sections (#5921, #5924) prepared to aid in characterisation of this unusual substance and the results included in this report.**

**Quantitative XRD Results:***SiroQuant version 3*

	<b>9519</b>	<b>9520</b>	<b>9521</b>	<b>9522</b>	<b>9523</b>	<b>9524</b>
Spiked sample Amorp. Content	57.2	44.9	72	77.9	66.3	80.3
Original sample Amorp. Content	<b>63.5</b>	<b>49.9</b>	<b>80</b>	<b>85.8</b>	<b>73.7</b>	<b>89.2</b>
Quartz	<b>21.1</b>	<b>16.6</b>	<b>2</b>	<b>1.7</b>	<b>14.3</b>	<b>1.6</b>
Muscovite	<b>11.6</b>	<b>16</b>	<b>2.1</b>	<b>1.6</b>	<b>4.5</b>	<b>1.4</b>
Chlorite	<b>0.2</b>	<b>0.4</b>	<b>0.1</b>	<b>0.2</b>	<b>0.9</b>	<b>0.2</b>
Pyrite	<b>1</b>	<b>5.9</b>	<b>2.4</b>	<b>6.9</b>	<b>1.4</b>	<b>5.3</b>
Sphalerite	<b>2.1</b>	<b>2.2</b>	<b>12</b>	<b>1.9</b>	<b>3.3</b>	<b>1.9</b>
Galena	<b>0</b>	<b>0.3</b>	<b>0.7</b>	<b>0.3</b>	<b>1.2</b>	<b>0.2</b>
Dolomite	<b>0.1</b>	<b>6.8</b>	<b>0.1</b>	<b>0.7</b>	<b>0</b>	<b>0</b>
Anhydrite	<b>0</b>	<b>0</b>	<b>0.4</b>	<b>0.5</b>	<b>0</b>	<b>0</b>
Kaolin	<b>0.4</b>	<b>1.9</b>	<b>0.1</b>	<b>0.2</b>	<b>0.7</b>	<b>0</b>
Goethite	<b>0</b>	<b>0.1</b>	<b>0</b>	<b>0.2</b>	<b>0</b>	<b>0.2</b>

Sample 9519 – PIT 115

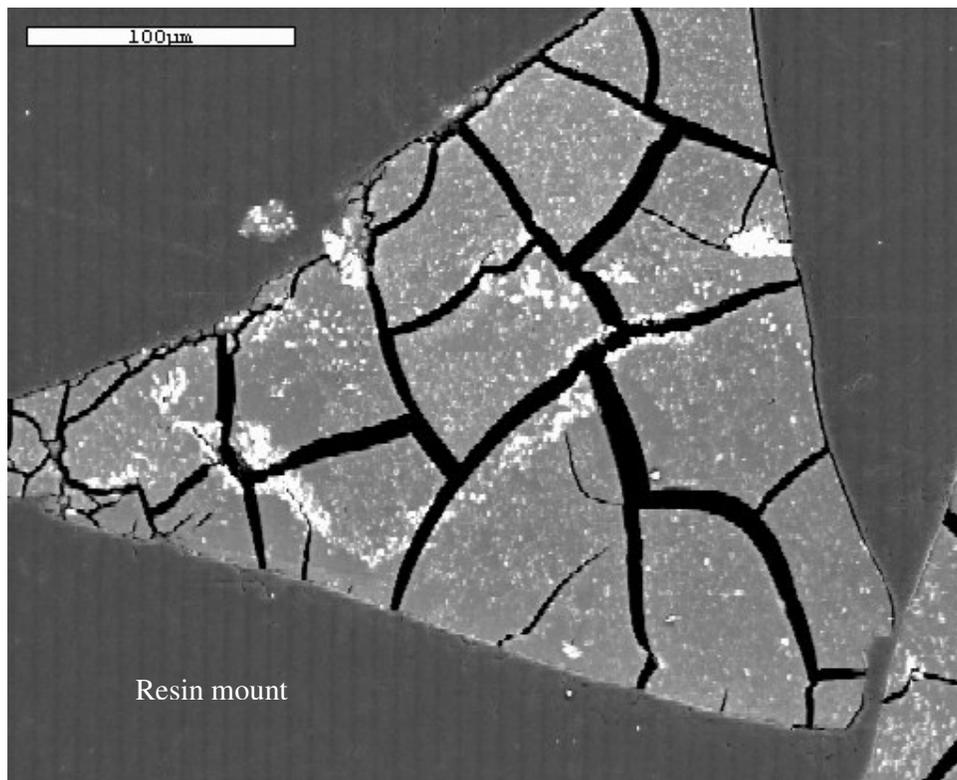
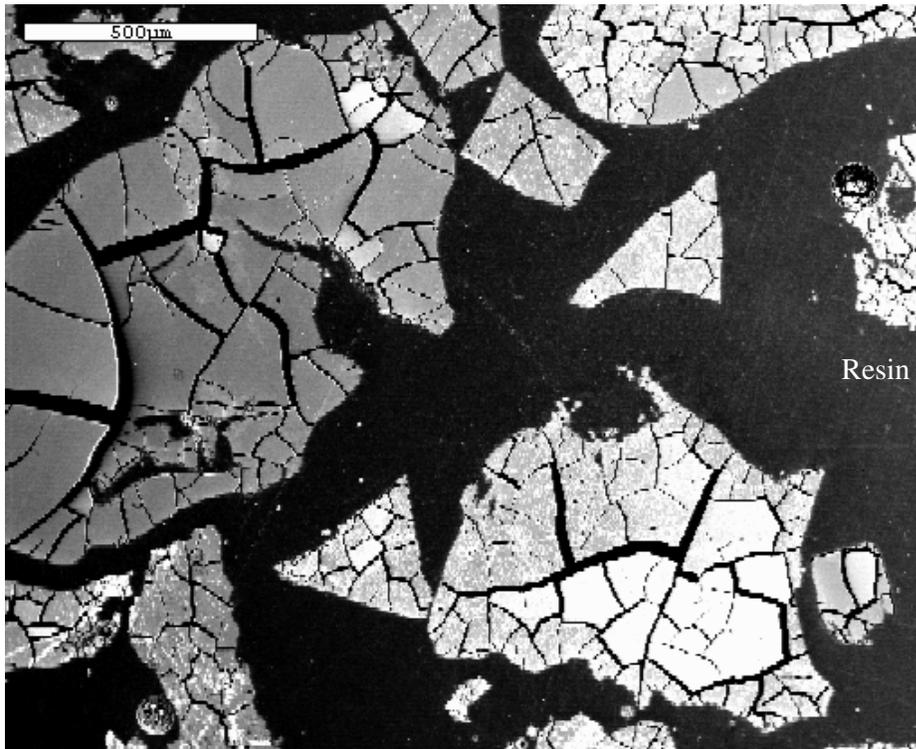
Sample 9520 – PIT 170

Sample 9521 – PIT 181

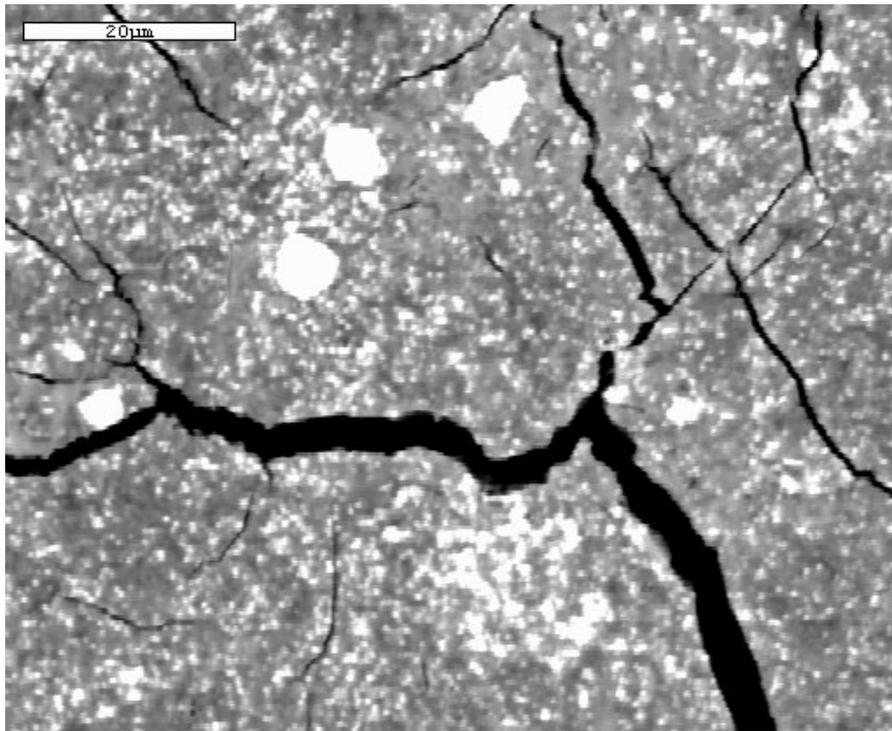
Sample 9522 – PIT 264

Sample 9523 – PIT 368

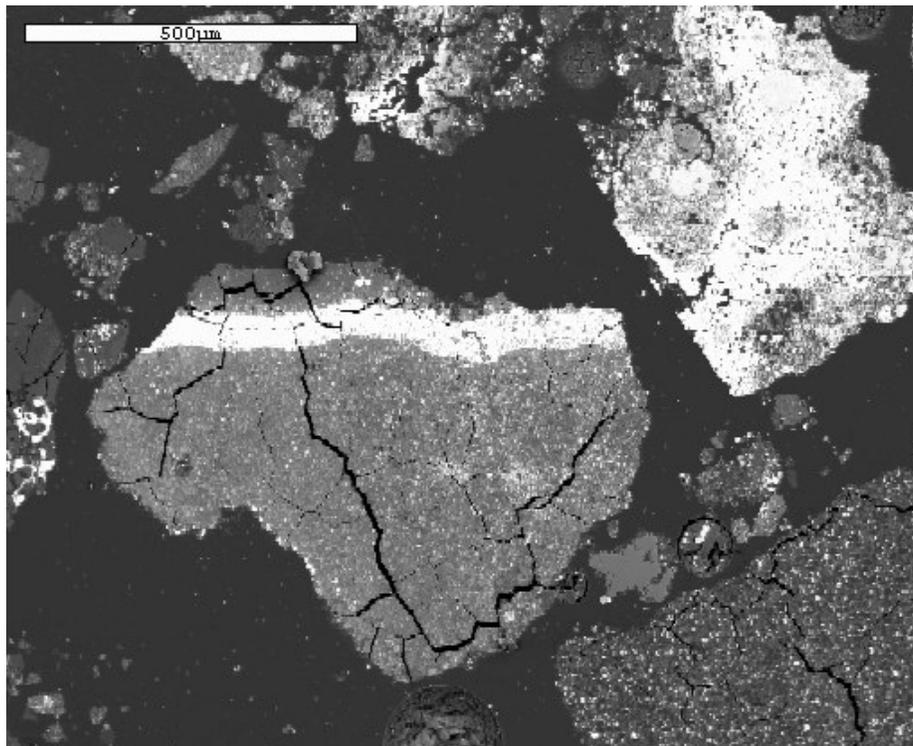
Sample 9524 – additional “darkish” sample ex – PIT 264



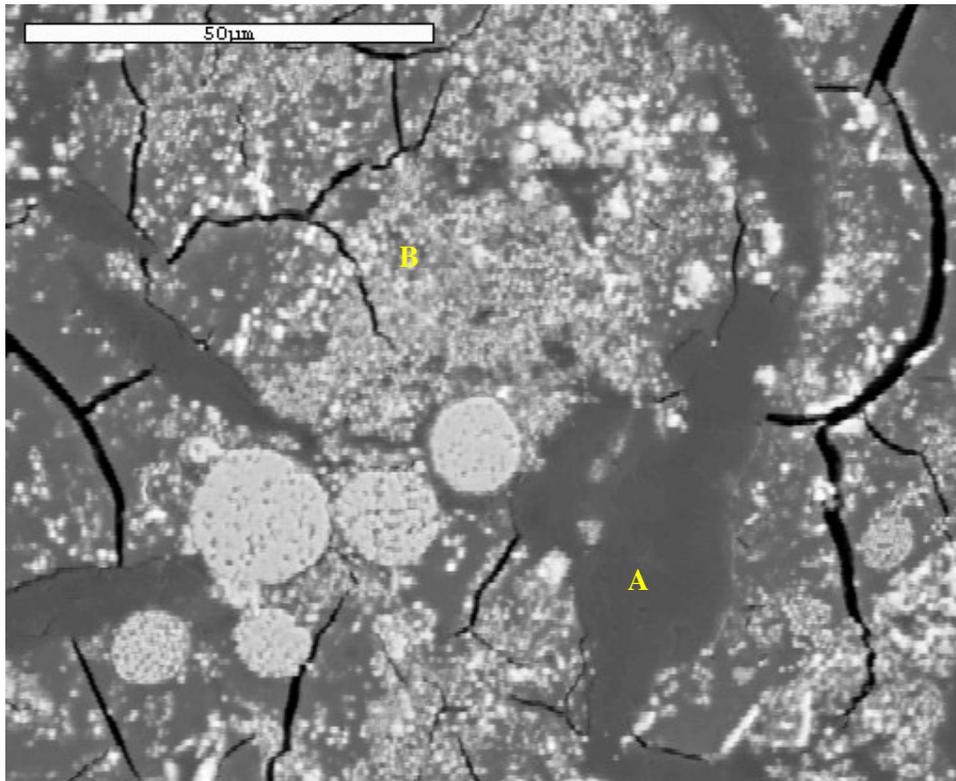
**SEM BSE images obtained from polished sections showing typical amorphous organic particles in samples provided. Note the desiccation cracks, bright spots are mainly sphalerite.**



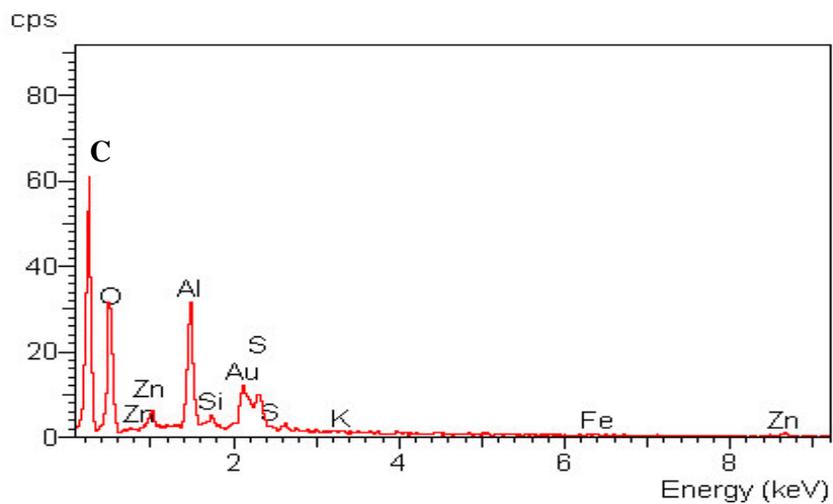
**Higher magnification view of sphalerite rich particle – sphalerite is bright phase and nearly pure ZnS – note fine grainsize in places.**



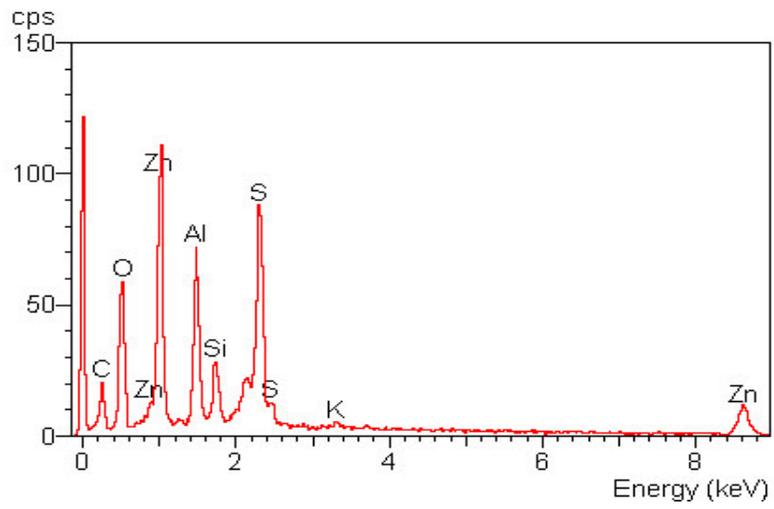
**ZnS rich particle at top right, bright band through the centre particle is anglesite.**



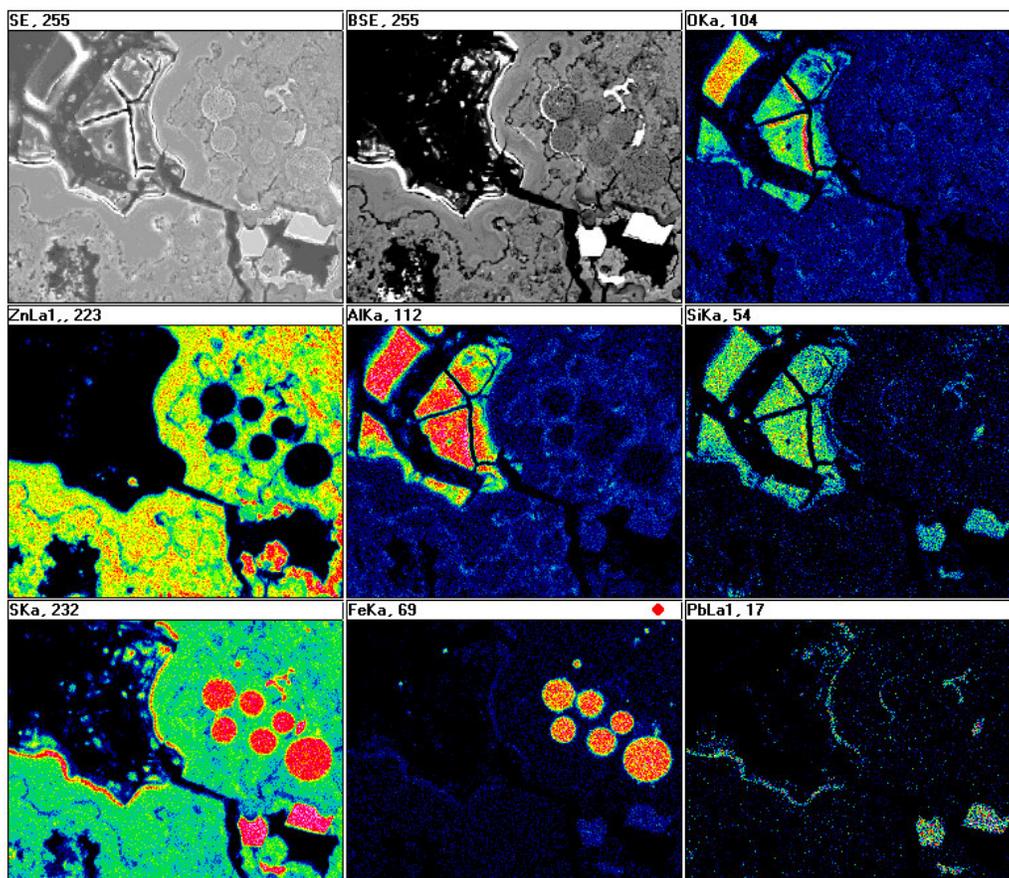
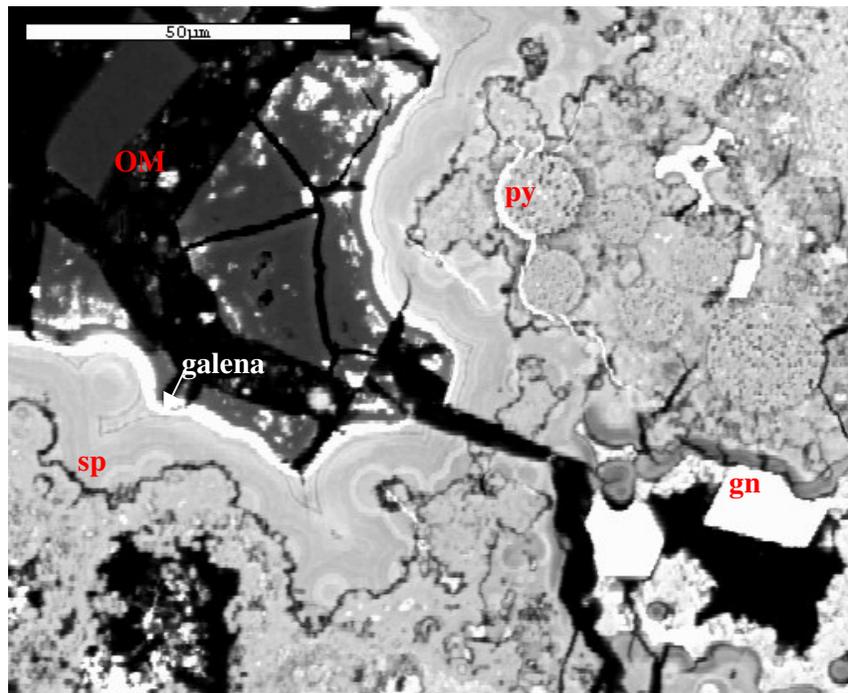
Pyrite framboids, sphalerite and galena in amorphous host – note cryptic banding and syneresis cracks.



Typical EDS x-ray spectrum obtained from the sulphide free area in the image above (A), note the high carbon content.



**Typical EDS x-ray spectrum obtained from a sphalerite rich region (B) – shown above.**



Colloform sphalerite with secondary galena overgrowth – SEM BSE above, element maps below.