Appendices

Appendix I. Details of flotation results presented in Chapter 5

Table I.1. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t PNBX

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
0.5	RC1	3.18	3.18	4.0	18.6	11.5	0.20	9.6	9.6	8.6	8.6	11.7	11.7	6.4	6.4	4.0	18.6	11.5	0.20
1	RC2	1.21	4.39	18.6	16.2	15.0	1.07	17.2	26.7	2.9	11.5	5.8	17.6	13.1	19.5	8.0	17.9	12.5	0.44
2	RC3	1.48	5.87	12.7	17.1	13.9	0.93	14.3	41.1	3.7	15.2	6.6	24.2	13.9	33.4	9.2	17.7	12.8	0.56
3	RC4	1.15	7.02	10.7	18.8	14.0	0.86	9.4	50.5	3.2	18.3	5.2	29.3	10.0	43.4	9.4	17.9	13.0	0.61
8	RC5	3.09	10.11	9.7	19.4	13.9	0.87	22.8	73.3	8.7	27.1	13.8	43.1	27.2	70.6	9.5	18.4	13.3	0.69
12	RC6	1.94	12.05	5.8	19.0	13.9	0.55	8.6	81.9	5.4	32.5	8.7	51.8	10.8	81.3	8.9	18.5	13.4	0.67
	RT	87.95		0.27	5.26	1.71	0.02	18.1		67.5		48.2		18.7					
	Head	**100.00**		**1.31**	**6.85**	**3.12**	**0.10**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Collector dosage: 50 g/t PNBX
Conditioning time: 3 minutes
Frother: 100g/t Dowfroth 200

Table I.2. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 100 g/t PNBX

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
0.5	RC1	3.37	3.37	14.2	22.5	14.4	0.85	30.8	30.8	10.9	10.9	14.4	14.4	32.1	32.1	14.2	22.5	14.4	0.85
1	RC2	1.17	4.54	10.8	21.3	13.2	0.69	8.1	39.0	3.6	14.4	4.6	19.0	9.0	41.1	13.3	22.2	14.1	0.81
2	RC3	1.51	6.05	9.6	21.7	13.3	0.67	9.3	48.3	4.7	19.1	6.0	24.9	11.3	52.5	12.4	22.1	13.9	0.77
2.5	RC4	0.75	6.80	9.0	21.5	13.8	0.63	4.3	52.7	2.3	21.4	3.1	28.0	5.3	57.8	12.0	22.0	13.9	0.76
5	RC5	4.68	11.48	5.7	19.4	12.6	0.38	17.2	69.8	13.0	34.4	17.5	45.5	19.9	77.7	9.4	20.9	13.4	0.60
8	RC6	4.39	15.87	3.2	16.8	10.9	0.16	9.1	78.9	10.6	45.0	14.2	59.7	7.9	85.6	7.7	19.8	12.7	0.48
12	RC7	1.05	16.92	3.5	18.7	11.4	0.16	2.4	81.3	2.8	47.8	3.6	63.3	1.9	87.4	7.5	19.7	12.6	0.46
	RT	83.08		0.35	4.39	1.49	0.01	18.7		52.2		36.7		12.6					
	Head	**100.00**		**1.55**	**6.99**	**3.37**	**0.09**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Collector dosage: 100 g/t PNBX
Conditioning time: 3 minutes
Frother: 100g/t Dowfroth 200

Table I.3. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t PNBX and 50 ppm ($2.4x10^{-4}$M) Pb(II)

Time	Product	Mass Pull (%)		Assay (%)			Pb Recovery		Zn Recovery		Fe Recovery		Cumulative Grade (%)		
(min)		Ind	Cumul	Pb	Zn	Fe	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe
0.5	RC1	2.54	2.54	3.7	17.8	13.5	7.1	7.1	6.7	6.7	10.9	10.9	3.7	17.8	13.5
1	RC2	1.36	3.90	14.1	22.8	15.8	14.5	21.6	4.6	11.3	6.8	17.7	7.3	19.5	14.3
2	RC3	1.18	5.08	9.9	21.3	14.5	8.8	30.5	3.7	15.0	5.4	23.2	7.9	20.0	14.3
3	RC4	1.08	6.16	9.8	21.2	14.5	8.0	38.5	3.4	18.3	5.0	28.2	8.3	20.2	14.4
8	RC5	3.17	9.33	8.6	20.8	14.2	20.6	59.1	9.7	28.1	14.3	42.5	8.4	20.4	14.3
12	RC6	1.75	11.08	6.5	18.8	14.5	8.6	67.7	4.9	32.9	8.1	50.5	8.1	20.1	14.3
	RT	88.92		0.48	5.11	1.75	32.3		67.1		49.5				
	Head	**100.00**		**1.32**	**6.77**	**3.15**	**100.0**		**100.0**		**100.0**				

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Activator: [Pb(II)] = $2.4x10^{-4}$M
Activation time: 30 minutes
Collector dosage: 50 g/t PNBX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Table I.4. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t PNBX and 100 ppm ($4.8x10^{-4}$M) Pb(II)

Time	Product	Mass Pull (%)		Assay (%)			Pb Recovery		Zn Recovery		Fe Recovery		Cumulative Grade (%)		
(min)		Ind	Cumul	Pb	Zn	Fe	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe
0.5	RC1	2.51	2.51	4.6	17.1	14	7.8	7.8	7.1	7.1	11.4	11.4	4.6	17.1	14.0
1	RC2	0.92	3.43	11.8	24	14.3	7.3	15.1	3.7	10.8	4.3	15.7	6.5	19.0	14.1
2	RC3	1.09	4.52	9.6	21.8	12.9	7.1	22.2	3.9	14.7	4.6	20.2	7.3	19.6	13.8
3	RC4	0.87	5.39	10.2	22.4	13.2	6.0	28.2	3.2	18.0	3.7	24.0	7.7	20.1	13.7
8	RC5	2.62	8.01	9.6	21.4	13.1	17.0	45.2	9.3	27.3	11.1	35.1	8.4	20.5	13.5
12	RC6	1.6	9.61	8.4	18.7	13.2	9.1	54.2	5.0	32.3	6.9	41.9	8.4	20.2	13.5
	RT	90.39		0.75	4.51	1.98	45.8		67.7		58.1				
	Head	**100.00**		**1.48**	**6.02**	**3.08**	**100.0**		**100.0**		**100.0**				

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Activator: [Pb(II)] = $4.8x10^{-4}$M
Activation time: 30 minutes
Collector dosage: 50 g/t PNBX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Table I.5. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t PNBX and 200 ppm ($9.7x10^{-4}$M) Pb(II)

Time	Product	Mass Pull (%)		Assay (%)			Pb Recovery		Zn Recovery		Fe Recovery		Cumulative Grade (%)		
(min)		Ind	Cumul	Pb	Zn	Fe	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe
0.5	RC1	2.27	2.27	7.13	16.1	13.4	9.8	9.8	5.9	5.9	10.4	10.4	7.1	16.1	13.4
1	RC2	0.94	3.21	10.4	27.9	13.5	5.9	15.7	4.2	10.1	4.3	14.8	8.1	19.6	13.4
2	RC3	1.38	4.59	9.51	25.8	12.3	8.0	23.7	5.7	15.8	5.8	20.6	8.5	21.4	13.1
3	RC4	1.06	5.65	9.8	24.8	13	6.3	30.0	4.2	20.1	4.7	25.3	8.8	22.1	13.1
8	RC5	2.64	8.29	8.89	23.2	13	14.2	44.2	9.9	29.9	11.7	37.0	8.8	22.4	13.0
12	RC6	2.41	10.70	7.8	15.8	10.4	11.4	55.6	6.1	36.0	8.6	45.6	8.6	20.9	12.5
	RT	89.3		0.82	4.45	1.78	44.4		64.0		54.4				
	Head	**100.00**		**1.65**	**6.21**	**2.92**	**100.0**		**100.0**		**100.0**				

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Activator: [Pb(II)] = $9.7x10^{-4}$M
Activation time: 30 minutes
Collector dosage: 50 g/t PNBX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Table I.6. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t PNBX and 100 ppm ($1.6x10^{-3}$M) Cu(II)

Time	Product	Mass Pull (%)		Assay (%)			Pb Recovery		Zn Recovery		Fe Recovery		Cumulative Grade (%)		
(min)		Ind	Cumul	Pb	Zn	Fe	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe
0.5	RC1	5.41	5.41	5.8	16.7	13.8	21.1	21.1	18.4	18.4	23.0	23.0	5.8	16.7	13.8
1	RC2	1.31	6.72	4.4	51.8	5.4	3.9	24.9	13.8	32.2	2.2	25.2	5.5	23.5	12.2
2	RC3	1.65	8.37	5.5	44.9	6.9	6.1	31.0	15.1	47.2	3.5	28.7	5.5	27.8	11.1
3	RC4	1.18	9.55	6.3	40.2	7.6	5.0	36.0	9.6	56.9	2.8	31.4	5.6	29.3	10.7
8	RC5	3.92	13.47	6.1	24.8	10.4	16.1	52.1	19.8	76.6	12.6	44.0	5.8	28.0	10.6
12	RC6	1.71	15.18	5.5	15.7	9.7	6.3	58.4	5.5	82.1	5.1	49.1	5.7	26.6	10.5
	RT	84.82		0.73	1.04	1.95	41.6		17.9		50.9				
	Head	**100.00**		**1.49**	**4.92**	**3.25**	**100.0**		**100.0**		**100.0**				

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Activator: [Cu(II)] = $1.6x10^{-3}$M
Activation time: 30 minutes
Collector dosage: 50 g/t PNBX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Table I.7. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t PNBX, 100 ppm ($1.6x10^{-3}$M) Cu(II) and 100 ppm ($4.8x10^{-4}$M) Pb(II)

Time	Product	Mass Pull (%)		Assay (%)			Pb Recovery		Zn Recovery		Fe Recovery		Cumulative Grade (%)		
(min)		Ind	Cumul	Pb	Zn	Fe	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe
0.5	RC1	5.7	5.70	4.9	41.7	5.1	17.1	17.1	37.5	37.5	10.1	10.1	4.9	41.7	5.1
1	RC2	1.7	7.40	5.6	37.7	6.9	5.8	23.0	10.1	47.6	4.1	14.2	5.1	40.8	5.5
2	RC3	1.82	9.22	6.6	35.3	7.7	7.4	30.3	10.1	57.8	4.9	19.1	5.4	39.7	5.9
3	RC4	1.26	10.48	6.4	33	8.2	4.9	35.3	6.6	64.3	3.6	22.6	5.5	38.9	6.2
8	RC5	4.79	15.27	5.8	21.4	10.8	17.0	52.3	16.2	80.5	18.0	40.6	5.6	33.4	7.7
12	RC6	2.22	17.49	4.6	13.7	11.5	6.3	58.5	4.8	85.3	8.9	49.5	5.5	30.9	8.1
	RT	82.51		0.82	1.13	1.76	41.5		14.7		50.5				
	Head	**100.00**		**1.63**	**6.34**	**2.88**	**100.0**		**100.0**		**100.0**				

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Activator: [Cu(II)] = $1.6x10^{-3}$M and [Pb(II)] = $4.8x10^{-4}$M
Activation time: 30 minutes
Collector dosage: 50 g/t PNBX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Table I.8. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX

Time	Product	Mass Pull (%)		Assay (%)		Pb Recovery		Zn Recovery		Cumulative Grade (%)	
(min)		Ind	Cumul	Pb	Zn	Ind	Cumul	Ind	Cumul	Pb	Zn
0.5	RC1	1.94	1.94	20.5	21.1	22.9	22.9	5.7	5.7	20.5	21.1
2	RC2	1.93	3.87	15.9	23	17.7	40.6	6.1	11.8	18.2	22.0
8	RC3	4.03	7.90	9.6	25.8	22.3	62.9	14.4	26.2	13.8	24.0
	RT	92.1		0.7	5.8	37.1		73.8			
	Head	**100.00**		**1.74**	**7.23**	**100.0**		**100.0**			

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Table I.9. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 100 g/t SNPX

Time	Product	Mass Pull (%)		Assay (%)		Pb Recovery		Zn Recovery		Cumulative Grade (%)	
(min)		Ind	Cumul	Pb	Zn	Ind	Cumul	Ind	Cumul	Pb	Zn
0.5	RC1	4.7	4.70	14.9	24.4	44.7	44.7	14.9	14.9	14.9	24.4
2	RC2	2.8	7.50	10.6	27.6	18.9	63.6	10.1	25.0	13.3	25.6
8	RC3	4.6	12.10	5.5	31.8	16.2	79.8	19.0	44.0	10.3	28.0
	RT	87.9		0.36	4.9	20.2		56.0			
	Head	**100.00**		**1.57**	**7.69**	**100.0**		**100.0**			

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Collector dosage: 100 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Table I.10. Experimental data for the flotation of the Rosh Pinah composite in the presence of 50 g/t PNBX and 20g/t NaCN

Time	Product	Mass Pull (%)		Assay (%)		Pb Recovery		Zn Recovery		Cumulative Grade (%)	
(min)		Ind	Cumul	Pb	Zn	Ind	Cumul	Ind	Cumul	Pb	Zn
0.5	RC1	2.16	2.16	18.1	19.2	28.6	28.6	6.4	6.4	18.1	19.2
1	RC2	0.84	3.00	14.1	20.3	8.7	37.3	2.6	9.0	17.0	19.5
2	RC3	1.25	4.25	13.4	21.3	12.3	49.5	4.1	13.1	15.9	20.0
3	RC4	0.9	5.15	11.5	18.5	7.6	57.1	2.6	15.7	15.2	19.8
8	RC5	2.57	7.72	8.8	22.9	16.6	73.7	9.1	24.8	13.0	20.8
12	RC6	1.21	8.93	6.4	23.3	5.7	79.3	4.4	29.2	12.1	21.1
	RT	91.07		0.31	5.04	20.7		70.8			
	Head	**100.00**		**1.37**	**6.48**	**100.0**		**100.0**			

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Depressant dosage: 20 g/t NaCN
Collector dosage: 50 g/t PNBX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Table I.11. Experimental data for the flotation of the Rosh Pinah composite in the presence of 50 g/t PNBX and 20g/t NaCN

Time	Product	Mass Pull (%)		Assay (%)		Pb Recovery		Zn Recovery		Cumulative Grade (%)	
(min)		Ind	Cumul	Pb	Zn	Ind	Cumul	Ind	Cumul	Pb	Zn
0.5	RC1	2.25	2.25	18.6	18.4	30.8	30.8	6.4	6.4	18.6	18.4
1	RC2	1.16	3.41	14.9	19.3	12.7	43.5	3.5	9.9	17.3	18.7
2	RC3	1.18	4.59	13.5	20.8	11.7	55.3	3.8	13.7	16.4	19.2
3	RC4	0.8	5.39	11.2	21.7	6.6	61.8	2.7	16.4	15.6	19.6
8	RC5	2.2	7.59	7.97	22.9	12.9	74.8	7.8	24.2	13.4	20.6
12	RC6	1.09	8.68	6.67	22	5.4	80.1	3.7	27.9	12.5	20.7
	RT	91.32		0.296	5.091	19.9		72.1			
	Head	**100.00**		**1.36**	**6.45**	**100.0**		**100.0**			

Experimental conditions:

Grind: 80% passing 75 micron (dry milling)
Depressant dosage: 20 g/t NaCN
Collector dosage: 50 g/t PNBX
Conditioning time: 3 minutes
Frother: 100 g/t Dowfroth 200

Appendix II. Details of experiments on the effect of copper cyanide and grinding environment on the flotation selectivity

Table II.1a. Pulp potential and dissolved oxygen during the flotation of the Rosh Pinah composite after dry and wet milling in a mild steel mill. Before activation

Time (Min)	Dry milling				Wet milling			
	Pulp potential (mV SHE)		Dissolved oxygen (ppm)		Pulp potential (mV SHE)		Dissolved oxygen (ppm)	
	50 g/t SNPX	70 g/t SNPX	50 g/t SNPX	70 g/t SNPX	50 g/t SNPX	70 g/t SNPX	50 g/t SNPX	70 g/t SNPX
1	150	140	4.4	4.5	-80	-100	1.7	1.2
4	140	123	3.6	4	-90	-106	1.3	1.1
5	120	110	3.5	4.2	-110	-112	1.3	1.1
6	145	140	6.5	7.5	-30	-30	2	2
7	150	145	8.1	8.1	10	4	4.7	4.6
9	170	160	8.1	8.2	100	78	6.9	6.7
15	180	169	8.2	8.2	140	130	7.9	7.9

Table II.1b. Pulp potential and dissolved oxygen during the flotation of the Rosh Pinah composite after dry and wet milling in a mild steel mill. Activation with 10^{-4}M Cu(I), 50 g/t SNPX

Time	Dry milling		Wet milling	
	Pulp potential	Dissolved oxygen	Pulp potential	Dissolved oxygen
(min)	(mV)	(ppm)	(mV)	(ppm)
1	99	3.3	-179	0.8
2	74	2.7	-173	0.8
3	52	2.1	-169	1.1
4	31	1.6	-180	0.8
5	13	1.3	-175	0.8
6	2	1.1	-175	0.8
7	-5	1	-180	0.7
8	-10	1	-176	0.7
9	-15	0.9	-176	0.7
10	-16	0.9	-176	0.7
11	-7	1.2	-146	0.6
12	6	1.4	-142	0.6
13	15	1.6	-133	0.6
14	23	1.9	-130	0.6
15	112	6.0	-21	3.6
16	115	7.5	54	5.7
18	122	7.8	90	7.3
24	130	8.1	95	8.1

Table II.2 . Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	3.39	3.39	15.3	27.8	10.8	0.53	23.1	23.1	11.4	11.4	10.5	10.5	16.0	16.0	15.3	27.8	10.8	0.53
2	RC2	2.87	6.26	10.5	27.9	10.4	0.5	13.4	36.6	9.6	21.0	8.6	19.1	12.8	28.8	13.1	27.8	10.6	0.52
4	RC3	3.64	9.90	8.2	28.7	10.9	0.46	13.3	49.9	12.6	33.6	11.4	30.5	14.9	43.7	11.3	28.2	10.7	0.50
10	RC4	6.65	16.55	5.1	26.4	11.2	0.45	15.1	65.0	21.2	54.7	21.4	52.0	26.6	70.3	8.8	27.5	10.9	0.48
	RT	83.45		0.94	4.5	2	0.04	35.0		45.3		48.0		29.7					
	Head	**100.00**		**2.24**	**8.30**	**3.48**	**0.11**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: dry
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table II.3 . Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 70 g/t SNPX

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	3.6	3.60	14.8	26.5	11.8	0.51	24.9	24.9	11.1	11.1	12.1	12.1	15.3	15.3	14.8	26.5	11.8	0.51
2	RC2	2.8	6.40	10.6	26.4	11.5	0.51	13.9	38.7	8.6	19.8	9.1	21.2	11.9	27.2	13.0	26.5	11.7	0.51
4	RC3	4.7	11.10	7.2	27.2	11.1	0.44	15.8	54.5	14.9	34.7	14.8	36.0	17.2	44.4	10.5	26.8	11.4	0.48
10	RC4	9.2	20.30	4.1	24.5	9.8	0.38	17.6	72.1	26.3	61.0	25.6	61.6	29.1	73.5	7.6	25.7	10.7	0.43
	RT	79.7		0.75	4.2	1.7	0.04	27.9		39.0		38.4		26.5					
	Head	**100.00**		**2.14**	**8.57**	**3.53**	**0.12**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: dry
Collector dosage: 70 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table II.4. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX. [Cu] = 10^{-4}M, [CN^-]/[Cu] =3

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	3.3	3.30	14.8	28.6	12.5	0.61	22.3	22.3	11.0	11.0	12.5	12.5	16.5	16.5	14.8	28.6	12.5	0.61
2	RC2	3.1	6.40	10.5	33.3	11.8	0.58	14.9	37.2	12.0	23.0	11.0	23.5	14.8	31.3	12.7	30.9	12.2	0.60
4	RC3	5.8	12.20	5.8	33.1	9.9	0.47	15.4	52.5	22.3	45.3	17.3	40.8	22.4	53.7	9.4	31.9	11.1	0.54
10	RC4	7.3	19.50	4.1	29.2	8.1	0.33	13.7	66.2	24.8	70.1	17.9	58.7	19.8	73.5	7.4	30.9	10.0	0.46
	RT	80.5		0.92	3.2	1.7	0.04	33.8		29.9		41.3		26.5					
	Head	**100.00**		**2.19**	**8.60**	**3.31**	**0.12**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: dry
Activator: [Cu] = 10^{-4}M, [CN^-]/[Cu] =3
Activation time: 10 minutes
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table II.5. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 70 g/t SNPX. [Cu] = 10^{-4}M, [CN^-]/[Cu] =3

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	6.3	6.30	11.7	29.6	13	0.56	31.1	31.1	20.7	20.7	23.3	23.3	27.1	27.1	11.7	29.6	13.0	0.56
2	RC2	5.1	11.40	5.5	31.8	9.9	0.39	11.8	42.9	18.0	38.7	14.3	37.6	15.3	42.4	8.9	30.6	11.6	0.48
4	RC3	7.5	18.90	3.8	27.9	7.5	0.31	12.0	54.9	23.2	62.0	16.0	53.6	17.9	60.2	6.9	29.5	10.0	0.41
10	RC4	4.3	23.20	7.7	31.4	11.2	0.49	14.0	68.9	15.0	77.0	13.7	67.3	16.2	76.4	7.0	29.9	10.2	0.43
	RT	76.8		0.96	2.7	1.5	0.04	31.1		23.0		32.7		23.6					
	Head	**100.00**		**2.37**	**9.00**	**3.52**	**0.13**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: dry
Activator: [Cu] = 10^{-4}M, [CN^-]/[Cu] =3
Activation time: 10 minutes
Collector dosage: 70 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table II.6. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX after wet milling

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	4.8	4.80	11.2	12.5	24.6	0.98	27.0	27.0	7.8	7.8	30.3	30.3	40.7	40.7	11.2	12.5	24.6	0.98
2	RC2	2.4	7.20	11.5	16.9	20	0.86	13.9	40.9	5.3	13.1	12.3	42.6	17.9	58.5	11.3	14.0	23.1	0.94
4	RC3	3.1	10.30	10.1	23.6	12.3	0.49	15.7	56.6	9.5	22.7	9.8	52.4	13.1	71.7	10.9	16.9	19.8	0.80
10	RC4	7.2	17.50	5	22.8	6.3	0.18	18.1	74.7	21.4	44.1	11.6	64.0	11.2	82.9	8.5	19.3	14.3	0.55
	RT	82.5		0.61	5.2	1.7	0.024	25.3		55.9		36.0		17.1					
	Head	**100.00**		**1.99**	**7.67**	**3.90**	**0.12**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (66% solids)
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table II.7. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 70 g/t SNPX

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	5.7	5.70	12	13.6	25.7	1.06	31.1	31.1	9.5	9.5	34.8	34.8	47.6	47.6	12.0	13.6	25.7	1.06
2	RC2	2	7.70	11	18.1	16	0.666	10.0	41.2	4.4	13.9	7.6	42.4	10.5	58.1	11.7	14.8	23.2	0.96
4	RC3	3.6	11.30	8.53	22.9	10.7	0.368	14.0	55.1	10.1	23.9	9.2	51.6	10.4	68.6	10.7	17.4	19.2	0.77
10	RC4	9.8	21.10	4.42	27.2	6.44	0.157	19.7	74.9	32.5	56.5	15.0	66.6	12.1	80.7	7.8	21.9	13.3	0.49
	RT	78.9		0.7	4.52	1.78	0.031	25.1		43.5		33.4		19.3					
	Head	**100.00**		**2.20**	**8.19**	**4.21**	**0.13**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (66% solids)
Collector dosage: 70 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table II.8. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX. [Cu] = 10^{-4}M, [CN^-]/[Cu] =3

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	5.2	5.20	11.9	11.3	26.5	1.12	29.0	29.0	7.1	7.1	33.5	33.5	44.9	44.9	11.9	11.3	26.5	1.12
2	RC2	2.8	8.00	11.6	16.7	17.1	0.63	15.2	44.3	5.6	12.7	11.6	45.1	13.6	58.5	11.8	13.2	23.2	0.95
4	RC3	2.8	10.80	10.4	27.3	11.7	0.49	13.7	57.9	9.2	22.0	8.0	53.0	10.6	69.1	11.4	16.8	20.2	0.83
10	RC4	7.8	18.60	4.3	31.7	6.01	0.2	15.7	73.7	29.9	51.8	11.4	64.4	12.0	81.2	8.4	23.1	14.3	0.57
	RT	81.4		0.69	4.9	1.8	0.03	26.3		48.2		35.6		18.8					
	Head	**100.00**		**2.13**	**8.28**	**4.12**	**0.13**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (66% solids)
Activator: [Cu] = 10^{-4}M, [CN^-]/[Cu] =3
Activation time: 10 minutes
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table II.9. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX. [Cu] = 10^{-3}M, [CN^-]/[Cu] =3

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	5.5	5.50	12.1	12.4	28	1.06	32.0	32.0	8.4	8.4	39.2	39.2	49.3	49.3	12.1	12.4	28.0	1.06
2	RC2	2.6	8.10	11.2	25.5	15.6	0.58	14.0	46.0	8.1	16.5	10.3	49.5	12.8	62.1	11.8	16.6	24.0	0.91
4	RC3	2.7	10.80	8.9	35	10.8	0.4	11.5	57.5	11.6	28.0	7.4	56.9	9.1	71.2	11.1	21.2	20.7	0.78
10	RC4	6.7	17.50	3.6	37.2	6.8	0.2	11.6	69.1	30.5	58.6	11.6	68.5	11.3	82.6	8.2	27.3	15.4	0.56
	RT	82.5		0.78	4.1	1.5	0.025	30.9		41.4		31.5		17.4					
	Head	**100.00**		**2.08**	**8.16**	**3.93**	**0.12**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (66% solids)
Activator: [Cu] = 10^{-3}M, [CN^-]/[Cu] =3
Activation time: 10 minutes
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table II.10. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 70 g/t SNPX. [Cu] = 10^{-3}M, [CN^-]/[Cu] =3

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	6.3	6.30	11.4	14.3	24.7	1	33.1	33.1	10.4	10.4	36.8	36.8	46.7	46.7	11.4	14.3	24.7	1.00
2	RC2	3.2	9.50	10.2	29.9	14.1	0.51	15.0	48.1	11.1	21.5	10.7	47.5	12.1	58.8	11.0	19.6	21.1	0.83
4	RC3	5.2	14.70	6.6	35.9	9.6	0.31	15.8	64.0	21.6	43.2	11.8	59.3	11.9	70.7	9.4	25.3	17.1	0.65
10	RC4	7.7	22.40	3.4	35.4	6.2	0.19	12.1	76.0	31.6	74.8	11.3	70.6	10.8	81.6	7.4	28.8	13.3	0.49
	RT	77.6		0.67	2.8	1.6	0.032	24.0		25.2		29.4		18.4					
	Head	**100.00**		**2.17**	**8.62**	**4.23**	**0.13**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (66% solids)
Activator: [Cu] = 10^{-3}M, [CN^-]/[Cu] =3
Activation time: 10 minutes
Collector dosage: 70 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Appendix III. Detailed results on the effect of CuCN on the flotation selectivity

Table III.1. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX.

Time	Product	Mass Pull (%)		Assay (%)		Pb Recovery		Zn Recovery		Cumulative Grade (%)	
(min)		Ind	Cumul	Pb	Zn	Ind	Cumul	Ind	Cumul	Pb	Zn
0.5	RC1	1.94	1.94	20.5	21.1	22.9	22.9	5.7	5.7	20.5	21.1
2	RC2	1.93	3.87	15.9	23	17.7	40.6	6.1	11.8	18.2	22.0
8	RC3	4.03	7.89	9.58	25.8	22.2	62.8	14.4	26.2	13.8	24.0
	RT	92.11		0.7	5.8	37.2		73.8			
	Head	**100.00**		**1.73**	**7.23**	**100.0**		**100.0**			

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: dry
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table III.2. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX.and $2x10^{-4}$M CuCN

Time	Product	Mass Pull (%)		Assay (%)		Pb Recovery		Zn Recovery		Cumulative Grade (%)	
(min)		Ind	Cumul	Pb	Zn	Ind	Cumul	Ind	Cumul	Pb	Zn
0.5	RC1	1.57	1.57	19.3	22.4	18.9	18.9	5.3	5.3	19.3	22.4
2	RC2	1.97	3.55	15	25.4	18.5	37.4	7.6	13.0	16.9	24.1
8	RC3	4.54	8.09	9.54	29.4	27.0	64.4	20.3	33.3	12.8	27.1
	RT	91.91		0.62	4.78	35.6		66.7			
	Head	**100.00**		**1.60**	**6.58**	**100.0**		**100.0**			

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: dry
Activator: $2x10^{-4}$M CuCN
Activation time: 10 minutes
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table III.3. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX.and 2x10^{-3}M CuCN

Time	Product	Mass Pull (%)		Assay (%)		Pb Recovery		Zn Recovery		Cumulative Grade (%)	
(min)		Ind	Cumul	Pb	Zn	Ind	Cumul	Ind	Cumul	Pb	Zn
0.5	RC1	1.82	1.82	18	26	23.1	23.1	7.2	7.2	18.0	26.0
2	RC2	2.39	4.21	11.3	30.7	19.1	42.2	11.1	18.3	14.2	28.7
8	RC3	5.39	9.60	5.98	34.3	22.7	64.9	28.0	46.2	9.6	31.8
	RT	90.40		0.55	3.93	35.1		53.8			
	Head	**100.00**		**1.42**	**6.61**	**100.0**		**100.0**			

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: dry
Activator: 2x10^{-3}M CuCN
Activation time: 10 minutes
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Appendix IV. Details of the experiments on the effect of sodium cyanide, zinc sulphate and ore mineralogy on the flotation selectivity

Table IV.1. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	4.24	4.24	11.1	11.3	30.4	1.18	27.2	27.2	6.9	6.9	31.3	31.3	43.6	43.6	11.1	11.3	30.4	1.18
2	RC2	2.06	6.30	11.5	15.2	22.4	0.77	13.7	40.9	4.5	11.5	11.2	42.5	13.8	57.5	11.2	12.6	27.8	1.05
4	RC3	2.22	8.52	10.9	19.4	15.7	0.6	14.0	54.9	6.2	17.7	8.5	50.9	11.6	69.1	11.1	14.4	24.6	0.93
8	RC4	6.46	14.98	6	20.4	7.5	0.22	22.4	77.4	19.1	36.8	11.8	62.7	12.4	81.5	8.9	17.0	17.2	0.62
	RT	85.02		0.46	5.14	1.81	0.025	22.6		63.2		37.3		18.5					
	Head	**100.00**		**1.73**	**6.91**	**4.12**	**0.11**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (67% solids)
Depressant dosage: 0 g/t NaCN
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table IV.2. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX and 50 g/t NaCN

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	4.633	4.63	12	10.3	29.3	1.13	28.2	28.2	6.8	6.8	32.0	32.0	43.7	43.7	12.0	10.3	29.3	1.13
2	RC2	2.186	6.82	12.8	14.6	23.6	0.9	14.2	42.4	4.5	11.3	12.2	44.2	16.4	60.1	12.3	11.7	27.5	1.06
4	RC3	2.68	9.50	10.8	17	13.4	0.5	14.7	57.1	6.5	17.8	8.5	52.7	11.2	71.2	11.8	13.2	23.5	0.90
8	RC4	4.89	14.39	7.3	20.7	7.7	0.25	18.1	75.2	14.4	32.2	8.9	61.6	10.2	81.4	10.3	15.7	18.1	0.68
	RT	85.61		0.57	5.57	1.9	0.026	24.8		67.8		38.4		18.6					
	Head	**100.00**		**1.97**	**7.03**	**4.24**	**0.12**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (67% solids)
Depressant dosage: 50 g/t NaCN
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table IV.3. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX and 75 g/t NaCN

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	4.66	4.66	11.3	10.6	29.4	1.1	30.7	30.7	7.1	7.1	33.7	33.7	44.9	44.9	11.3	10.6	29.4	1.10
2	RC2	1.83	6.49	11.3	15.1	21.1	0.81	12.1	42.8	4.0	11.1	9.5	43.2	13.0	57.9	11.3	11.9	27.1	1.02
4	RC3	2.28	8.77	10.9	17.9	14.4	0.53	14.5	57.3	5.9	17.0	8.1	51.3	10.6	68.5	11.2	13.4	23.8	0.89
8	RC4	3.05	11.82	8.1	20.7	8.8	0.31	14.4	71.7	9.1	26.2	6.6	57.9	8.3	76.8	10.4	15.3	19.9	0.74
	RT	88.18		0.55	5.79	1.94	0.03	28.3		73.8		42.1		23.2					
	Head	**100.00**		**1.71**	**6.92**	**4.06**	**0.11**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (67% solids)
Depressant dosage: 75 g/t NaCN
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table IV. 4. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX and 100 g/t NaCN

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	5.06	5.06	11.3	9.5	29.7	1.19	33.4	33.4	7.2	7.2	36.2	36.2	50.0	50.0	11.3	9.5	29.7	1.19
2	RC2	1.97	7.03	12	13.5	20.1	0.83	13.8	47.2	4.0	11.2	9.5	45.7	13.6	63.6	11.5	10.6	27.0	1.09
4	RC3	2.46	9.49	12	17.1	14.4	0.56	17.2	64.5	6.3	17.5	8.5	54.3	11.4	75.0	11.6	12.3	23.7	0.95
8	RC4	3.31	12.80	8.1	20	8.6	0.25	15.7	80.1	10.0	27.5	6.9	61.1	6.9	81.9	10.7	14.3	19.8	0.77
	RT	87.2		0.39	5.53	1.85	0.025	19.9		72.5		38.9		18.1					
	Head	**100.00**		**1.71**	**6.65**	**4.15**	**0.12**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (67% solids)
Depressant dosage: 100 g/t NaCN
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table IV.5. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX and 150 g/t NaCN

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	5.19	5.19	12.1	9.2	29	1.15	33.5	33.5	7.0	7.0	36.8	36.8	53.1	53.1	12.1	9.2	29.0	1.15
2	RC2	2	7.19	13.5	13.6	20.9	0.82	14.4	47.9	4.0	10.9	10.2	47.0	14.6	67.7	12.5	10.4	26.7	1.06
4	RC3	2.28	9.47	12.8	18.1	13.7	0.6	15.6	63.5	6.0	17.0	7.6	54.7	12.2	79.8	12.6	12.3	23.6	0.95
8	RC4	3.43	12.90	8	20.7	8.3	0.23	14.6	78.2	10.4	27.3	7.0	61.6	7.0	86.8	11.4	14.5	19.5	0.76
	RT	87.1		0.47	5.71	1.8	0.017	21.8		72.7		38.4		13.2					
	Head	**100.00**		**1.87**	**6.85**	**4.09**	**0.11**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (67% solids)
Depressant dosage: 150 g/t NaCN
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table IV.6. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX, 75 g/t NaCN and 100 g/t $ZnSO_4$

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	4.28	4.28	11.5	7.9	31.3	1.25	30.3	30.3	5.4	5.4	33.6	33.6	46.1	46.1	11.5	7.9	31.3	1.25
2	RC2	1.67	5.95	13	11.9	21.6	1	13.3	43.6	3.2	8.5	9.1	42.7	14.4	60.5	11.9	9.0	28.6	1.18
4	RC3	1.5	7.45	14.9	17.1	18.1	0.81	13.7	57.3	4.1	12.6	6.8	49.5	10.5	71.0	12.5	10.6	26.5	1.11
8	RC4	2.89	10.34	8.2	20	9.4	0.36	14.6	71.9	9.2	21.8	6.8	56.3	9.0	79.9	11.3	13.3	21.7	0.90
	RT	89.66		0.51	5.5	1.94	0.026	28.1		78.2		43.7		20.1					
	Head	**100.00**		**1.63**	**6.30**	**3.98**	**0.12**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (67% solids)
Depressant dosage: 75 g/t NaCN and 100 g/t $ZnSO_4$
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table IV.7. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX, 75 g/t NaCN and 200 g/t $ZnSO_4$

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	5.08	5.08	11.8	6.96	31	1.27	30.1	30.1	5.2	5.2	36.7	36.7	48.1	48.1	11.8	7.0	31.0	1.27
2	RC2	1.73	6.81	14.8	11.8	24	1.1	12.9	43.0	3.0	8.2	9.7	46.4	14.2	62.2	12.6	8.2	29.2	1.23
4	RC3	2.45	9.26	11.9	14.4	14.1	0.58	14.6	57.6	5.2	13.4	8.1	54.4	10.6	72.8	12.4	9.8	25.2	1.06
8	RC4	3.16	12.42	9.5	17.7	9.2	0.35	15.1	72.7	8.2	21.6	6.8	61.2	8.2	81.1	11.7	11.8	21.1	0.88
	RT	87.58		0.62	6.09	1.9	0.029	27.3		78.4		38.8		18.9					
	Head	**100.00**		**1.99**	**6.80**	**4.29**	**0.13**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (67% solids)
Depressant dosage: 75 g/t NaCN and 200 g/t $ZnSO_4$
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

Table IV.8. Experimental data for the flotation of the Rosh Pinah composite at pH 8.5 in the presence of 50 g/t SNPX, 75 g/t NaCN and 400 g/t $ZnSO_4$

Time	Product	Mass Pull (%)		Assay (%)				Pb Recovery		Zn Recovery		Fe Recovery		Cu Recovery		Cumulative Grade (%)			
(min)		Ind	Cumul	Pb	Zn	Fe	Cu	Ind	Cumul	Ind	Cumul	Ind	Cumul	Ind	Cumul	Pb	Zn	Fe	Cu
1	RC1	4.88	4.88	11.6	6.5	31.6	1.13	12.0	12.0	4.6	4.6	37.2	37.2	44.0	44.0	11.6	6.5	31.6	1.13
2	RC2	1.68	6.56	13.9	10.2	23.4	1.04	4.9	16.9	2.5	7.0	9.5	46.7	13.9	57.9	12.2	7.4	29.5	1.11
4	RC3	2	8.56	13.9	13.6	16.1	0.66	5.9	22.7	3.9	10.9	7.8	54.5	10.5	68.5	12.6	8.9	26.4	1.00
8	RC4	3.45	12.01	90	15.8	8.7	0.38	65.5	88.3	7.8	18.8	7.2	61.8	10.5	78.9	34.8	10.9	21.3	0.82
	RT	87.99		0.63	6.41	1.8	0.03	11.7		81.2		38.2		21.1					
	Head	**100.00**		**4.74**	**6.95**	**4.14**	**0.13**	**100.0**		**100.0**		**100.0**		**100.0**					

Experimental conditions:

Weight of sample: 1000 g
Grind: 80% passing 100 micron
Grinding type: wet (67% solids)
Depressant dosage: 75 g/t NaCN and 400 g/t $ZnSO_4$
Collector dosage: 50 g/t SNPX
Conditioning time: 3 minutes
Frother: 100 g/t Senfroth 9325

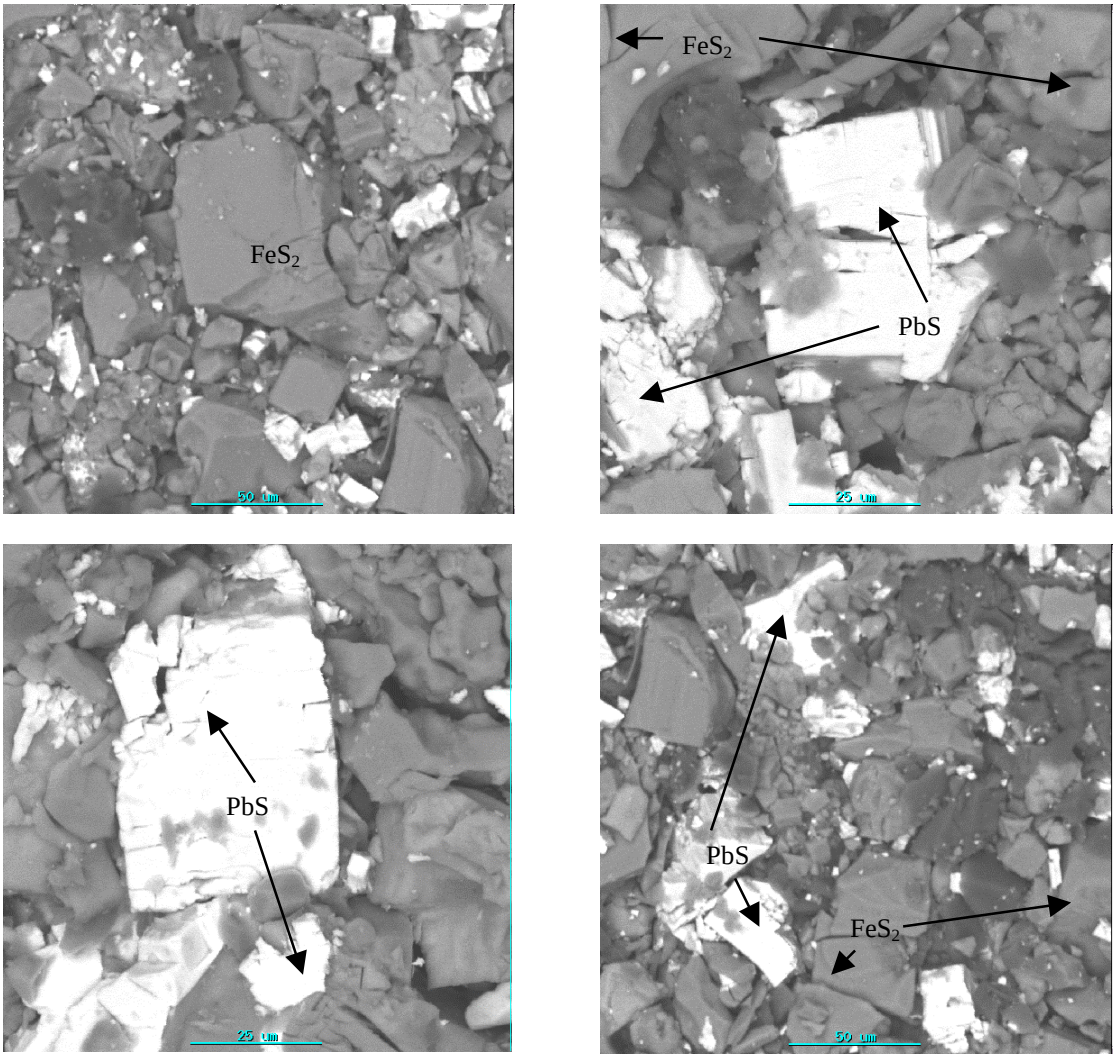

Figure IV.1. SEM- Backscattered images showing the presence of galena (white) and pyrite (grey) in the first concentrate. The flotation experiment was carried out in the presence of 100 g/t NaCN and 50 g/t SNPX.

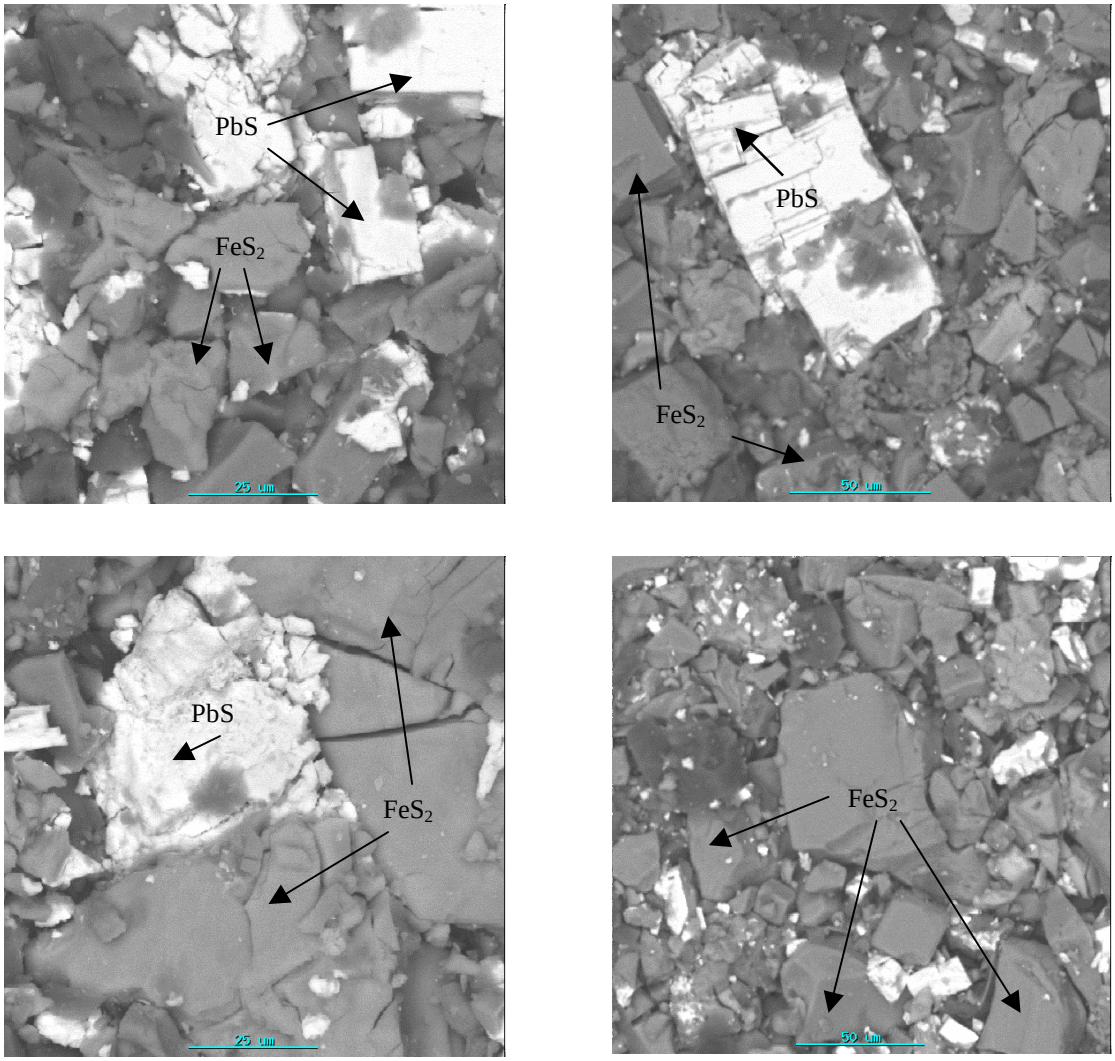

Figure IV.2. SEM- Backscattered images showing the presence of galena (white) and pyrite (grey) in the first concentrate. The flotation experiment was carried out in the presence of 100 g/t NaCN and 50 g/t SNPX.

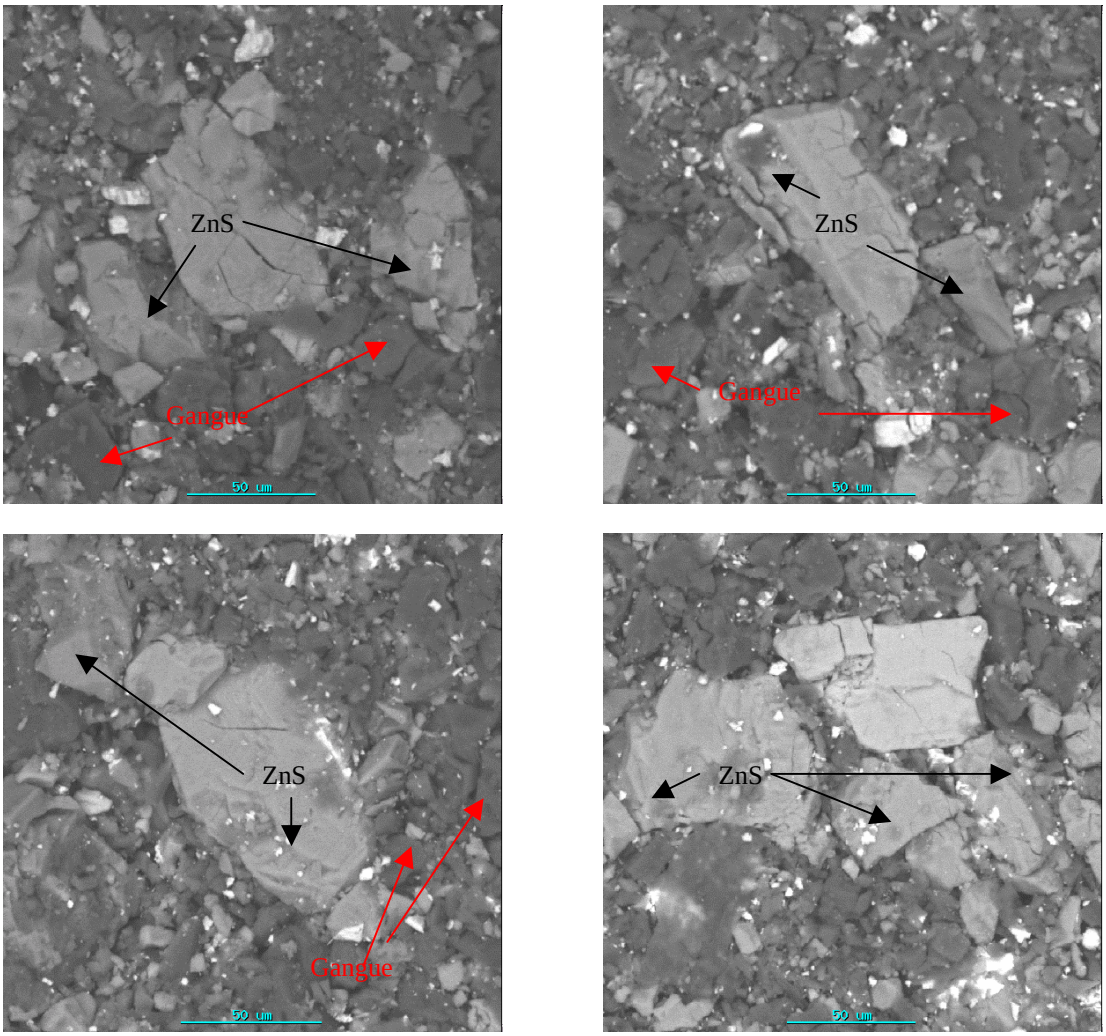

Figure IV.3. SEM- Backscattered images showing the presence sphalerite and gangue in the last concentrate. The flotation experiment was carried out in the presence of 100 g/t NaCN and 50 g/t SNPX.

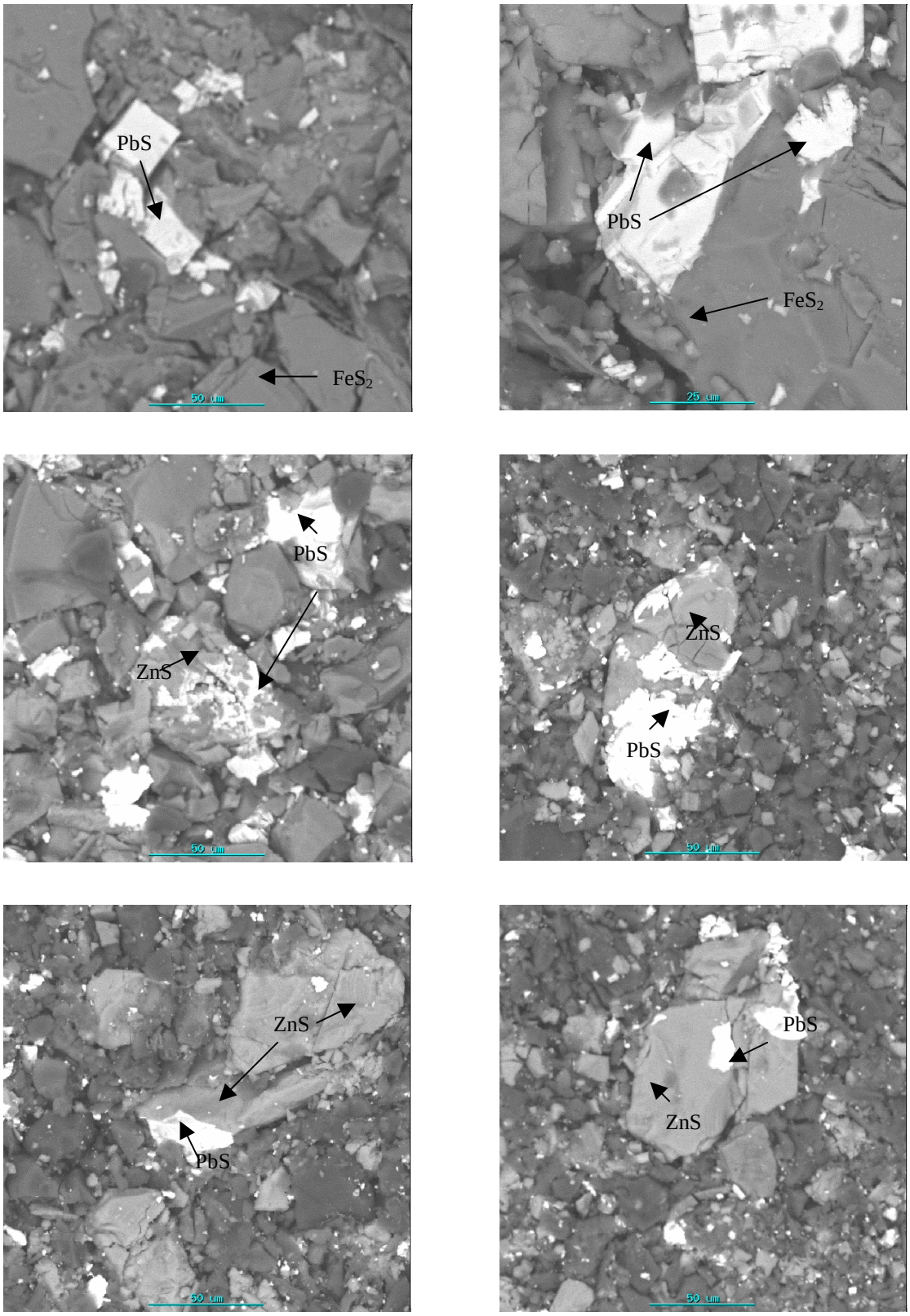

Figure IV.4. SEM- Backscattered images of concentrate showing the association between galena, sphalerite and pyrite in the galena concentrate.

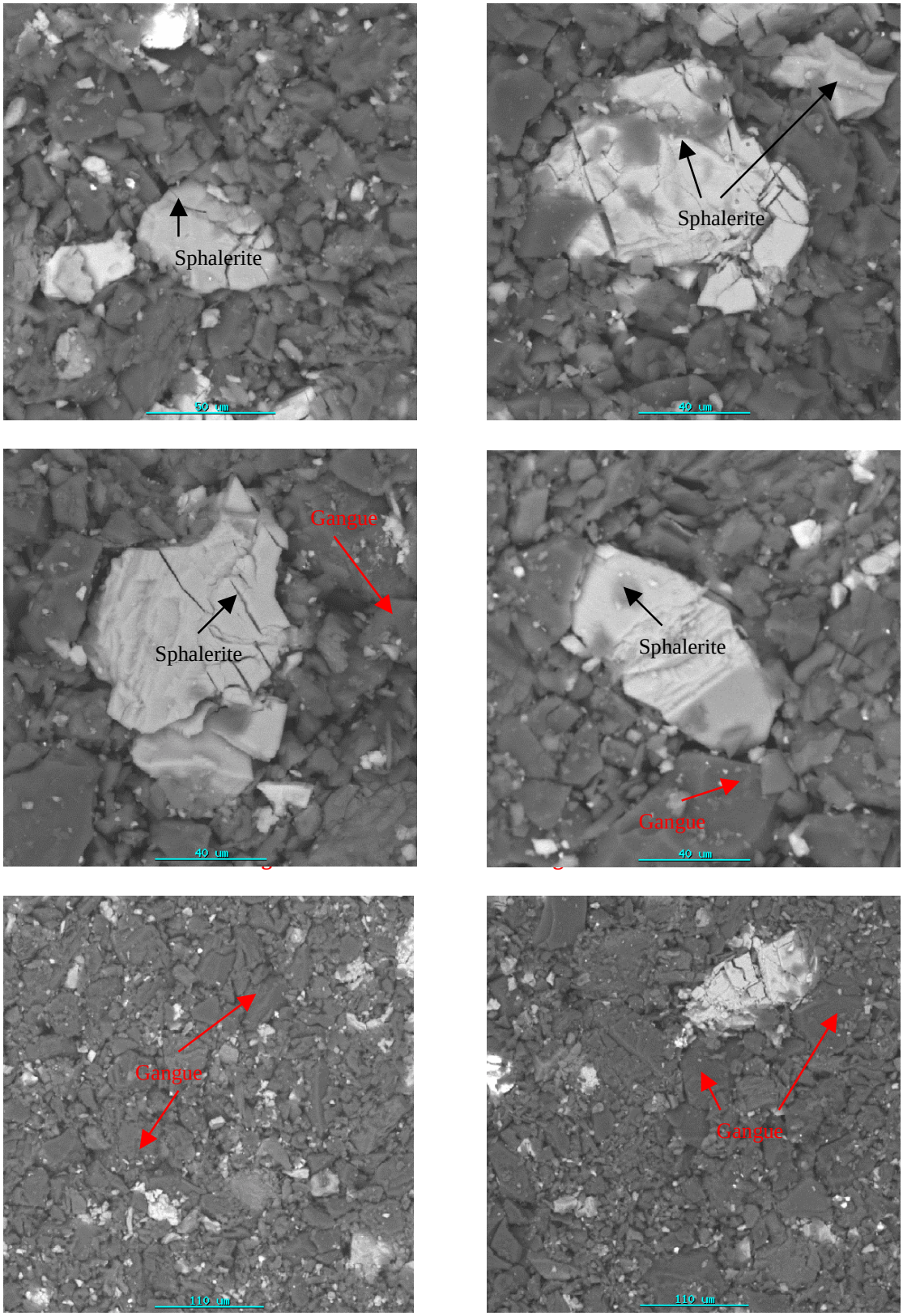

Figure IV.5. SEM- Backscattered images showing the general appearance of the rougher tailings. The flotation experiment was carried out in the presence of 100 g/t NaCN and 50 g/t SNPX.