Supplementary Tables

Table S1. Petrographic reflectance analysis results.

	Random Reflectance		Maximum Dense Graphite		Maximum Flake Graphite	
	Rr %	**s**	**Rm %**	**s**	**Rm %**	**s**
BM1 as-received	5.628	0.571	9.984	0.796	9.170	0.892
BM1 +1mm 550°C 15minutes	4.404	0.503	8.797	0.922	8.064	0.768
BM1 +0.25-1mm 550°C 15minutes	4.555	0.348	9.360	0.745	8.862	0.767
BM1 -0.25mm 550°C 15minutes	5.098	0.393	10.091	0.897	9.321	0.759
BM2 as-received	4.764	0.645	9.868	1.526	7.994	1.385
BM2 +1mm 550°C 15minutes	4.599	0.558	9.904	0.874	9.186	0.943
BM2 +0.25-1mm 550°C 15minutes	4.975	0.375	9.399	0.794	8.294	0.858
BM2 -0.25mm 550°C 15minutes	4.935	0.324	9.373	0.583	8.467	0.782
BM2 +0.25mm 600°C 1hour	5.371	0.533	10.310	0.805	9.389	1.125
BM2 +0.25mm 600°C 2hour	5.298	0.517	10.452	1.207	9.887	1.320
BM2 +0.25mm 600°C 3hour	5.098	0.765	10.881	1.074	9.614	1.392
BM2 +0.25mm 600°C 4hour	5.333	0.589	10.099	0.989	9.457	1.186
BM2 -0.25mm 600°C 1hour	5.616	0.606	11.412	0.877	10.185	1.231
BM2 -0.25mm 600°C 2hour	5.520	0.582	10.732	1.357	10.230	1.061
BM2 -0.25mm 600°C 3hour	5.250	0.531	10.700	0.697	9.960	0.820
BM2 -0.25mm 600°C 4hour	5.614	0.593	11.108	1.224	9.899	1.075

R_r – random reflectance; R_m – maximum reflectance; s – standard deviation

Table S2. Raman microspectroscopy results – calculated parameters.

	G-D_1 distance (cm^{-1})				D_1/G integrated intensity ratio				D_1/G FWHM ratio			
	Dense	**Flake**	**Ordered**	**Average**	**Dense**	**Flake**	**Ordered**	**Average**	**Dense**	**Flake**	**Ordered**	**Average**
BM1 as-received	231	231	-	231	1.8	1.2	-	1.5	2.4	2.1	-	2.3
BM1 +1mm 550°C 15minutes	228	230	-	229	2.1	2.0	-	2.1	2.3	2.0	-	2.1
BM1 +0.25-1mm 550°C 15minutes	230	231	230	230	1.6	1.7	1.0	1.6	1.9	2.2	2.1	2.0
BM1 -0.25mm 550°C 15minutes	230	230	229	230	0.9	1.8	0.4	1.0	2.1	2.2	1.8	2.1
BM2 as-received	215	232	230	225	1.5	1.6	1.1	1.3	1.1	0.9	2.3	1.3
BM2 +1mm 550°C 15minutes	229	-	-	229	2.0	-	-	2.0	2.5	-	-	2.5
BM2 +0.25-1mm 550°C 15minutes	228	228	-	228	2.0	2.1	-	2.0	2.5	2.4	-	2.5
BM2 -0.25mm 550°C 15minutes	230	231	230	230	2.3	1.9	1.7	2.0	2.6	2.1	2.8	2.4
BM2 +0.25mm 600°C 1hour	232	234	230	232	1.9	1.2	1.0	1.3	1.9	1.7	2.1	1.9
BM2 +0.25mm 600°C 2hour	227	233	232	230	1.5	1.2	1.0	1.2	2.3	1.0	2.5	1.7
BM2 +0.25mm 600°C 3hour	234	233	236	234	1.7	1.5	0.7	1.0	1.9	1.8	1.6	1.7
BM2 +0.25mm 600°C 4hour	231	232	230	231	1.6	1.6	1.3	1.5	2.1	2.2	2.6	2.3
BM2 -0.25mm 600°C 1hour	231	233	231	231	1.9	2.1	0.9	1.6	2.0	2.0	2.2	2.1
BM2 -0.25mm 600°C 2hour	232	230	231	232	1.4	1.1	1.0	1.2	1.6	1.7	2.3	1.9
BM2 -0.25mm 600°C 3hour	232	231	229	231	1.4	1.5	0.7	1.3	1.8	1.8	1.9	1.8
BM2 -0.25mm 600°C 4hour	234	233	232	233	1.6	1.8	1.1	1.6	1.8	2.1	2.2	2.0

Table S3. Raman microspectroscopy results – raw data.

	D_1											
	Average			Dense			Flake			Ordered		
	Position (cm^{-1})	FWHM (cm^{-1})	Integrated intensity (cm^{-1})	Position (cm^{-1})	FWHM (cm^{-1})	Integrated intensity (cm^{-1})	Position (cm^{-1})	FWHM (cm^{-1})	Integrated intensity (cm^{-1})	Position (cm^{-1})	FWHM (cm^{-1})	Integrated intensity (cm^{-1})
1	1355	48	567	1355	49	556	1355	46	582	-	-	-
2	1356	47	597	1356	43	589	1356	51	606	-	-	-
3	1356	46	611	1357	48	663	1356	49	679	1356	39	372
4	1355	49	530	1355	53	680	1354	49	477	1356	36	184
5	1351	44	1083	1352	42	1054	1349	51	1433	1352	42	938
6	1357	47	798	1357	47	798	-	-	-	-	-	-
7	1357	47	813	1357	47	855	1358	46	751	-	-	-
8	1355	56	775	1356	51	637	1353	61	1029	1356	55	541
9	1354	50	714	1354	52	670	1353	51	880	1354	45	533
10	1355	48	533	1358	49	516	1353	44	478	1354	49	575
11	1354	57	1009	1355	53	735	1354	55	756	1353	64	1536
12	1354	51	644	1355	51	653	1353	52	659	1355	49	621
13	1354	48	583	1355	52	680	1353	49	598	1355	42	421
14	1354	48	510	1354	51	664	1356	46	530	1354	47	351
15	1354	52	655	1354	59	845	1354	53	667	1355	39	350
16	1553	53	704	1353	55	798	1353	54	687	1354	46	557
	G											
1	1585	21	373	1586	20	302	1585	22	481	-	-	-
2	1586	22	292	1584	19	286	1587	25	297	-	-	-
3	1587	23	395	1587	25	411	1586	23	391	15	19	371
4	1585	23	533	1586	25	723	1585	22	259	1585	20	509
5	1576	34	812	1567	38	714	1581	59	883	1582	19	874
6	1586	19	390	1586	19	390	-	-	-	-	-	-
7	1585	19	394	1585	18	423	1586	19	351	-	-	-
8	1585	24	393	1586	20	277	1584	29	543	1586	19	326
9	1586	27	534	1586	27	359	1587	31	707	1585	21	537
10	1586	28	449	1585	21	346	1586	42	410	1585	20	571
11	1588	33	1017	1589	29	421	1587	31	497	1588	39	2133
12	1585	23	440	1585	24	406	1585	24	421	1585	19	492
13	1586	23	373	1586	25	350	1586	24	284	1585	19	496
14	1586	26	424	1586	31	485	1586	27	494	1585	20	340
15	1585	28	514	1586	33	594	1585	29	443	1584	21	500
16	1586	27	451	1586	31	487	1586	26	390	1586	21	518

1. BM1 as-received
2. BM1, +1mm, 550°C, 15 minutes
3. BM1, +0.25-1mm, 550°C, 15 minutes
4. BM1, -0.25mm, 550°C, 15 minutes
5. BM2 as-received
6. BM2, +1mm, 550°C, 15 minutes
7. BM2, +0.25-1mm, 550°C, 15 minutes
8. BM2, -0.25, 550°C, 15 minutes
9. BM2, +.25mm, 600°C, 1h
10. BM2, +0.25mm, 600°C, 2h
11. BM2, +0.25mm, 600°C, 3h
12. BM2, +0.25mm, 600°C, 4h
13. BM2, -0.25mm, 600°C, 1h
14. BM2, -0.25mm, 600°C, 2h
15. BM2, -0.25mm, 600°C, 3h
16. BM2, -0.25mm, 600°C, 4h

Supplementary Figures

Analysis of cathode chunks in BM using SEM-EDX

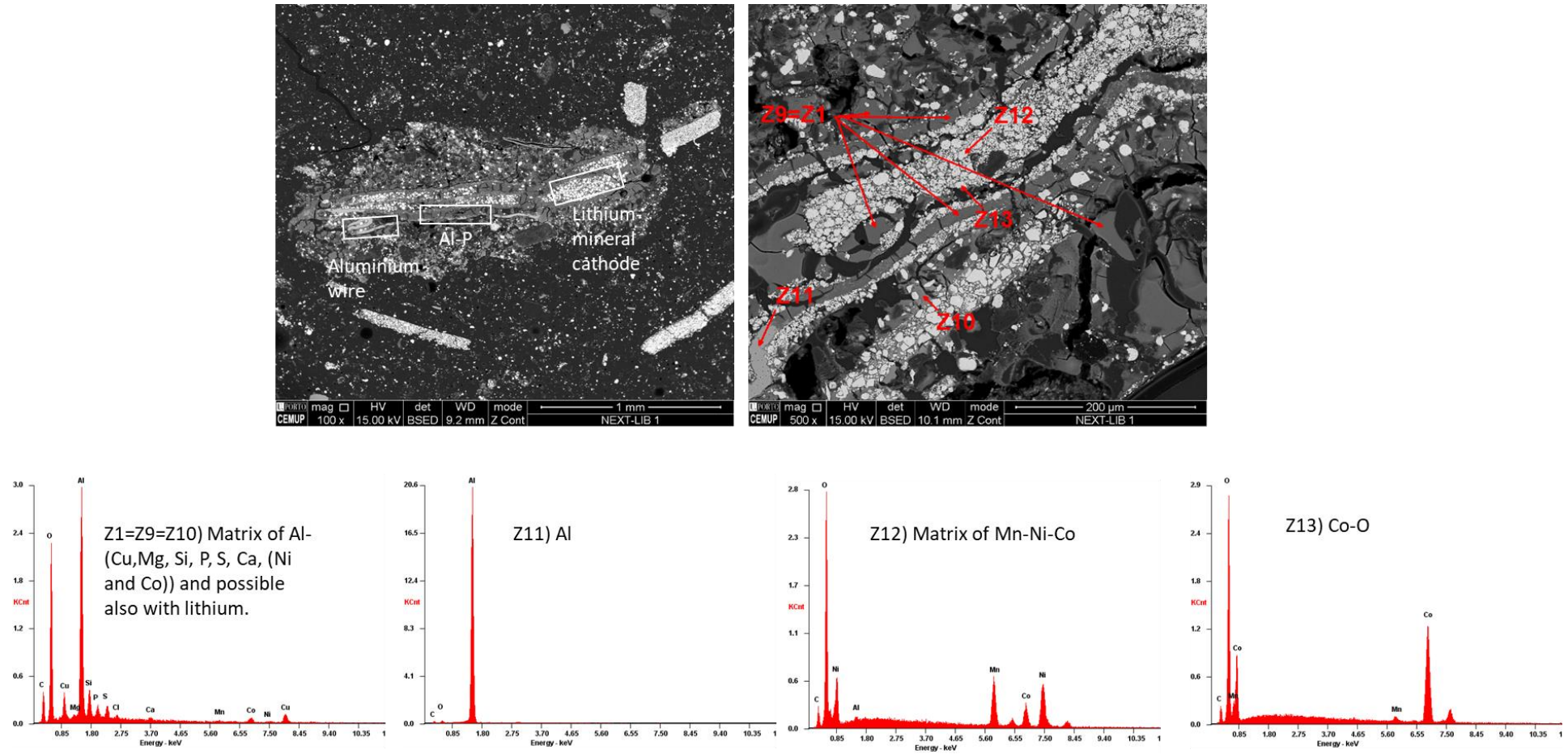


Figure S1. SEM-EDS analysis pressed aluminium-binder-cathode particles observed in the >250µm size fraction of BM2, polished block

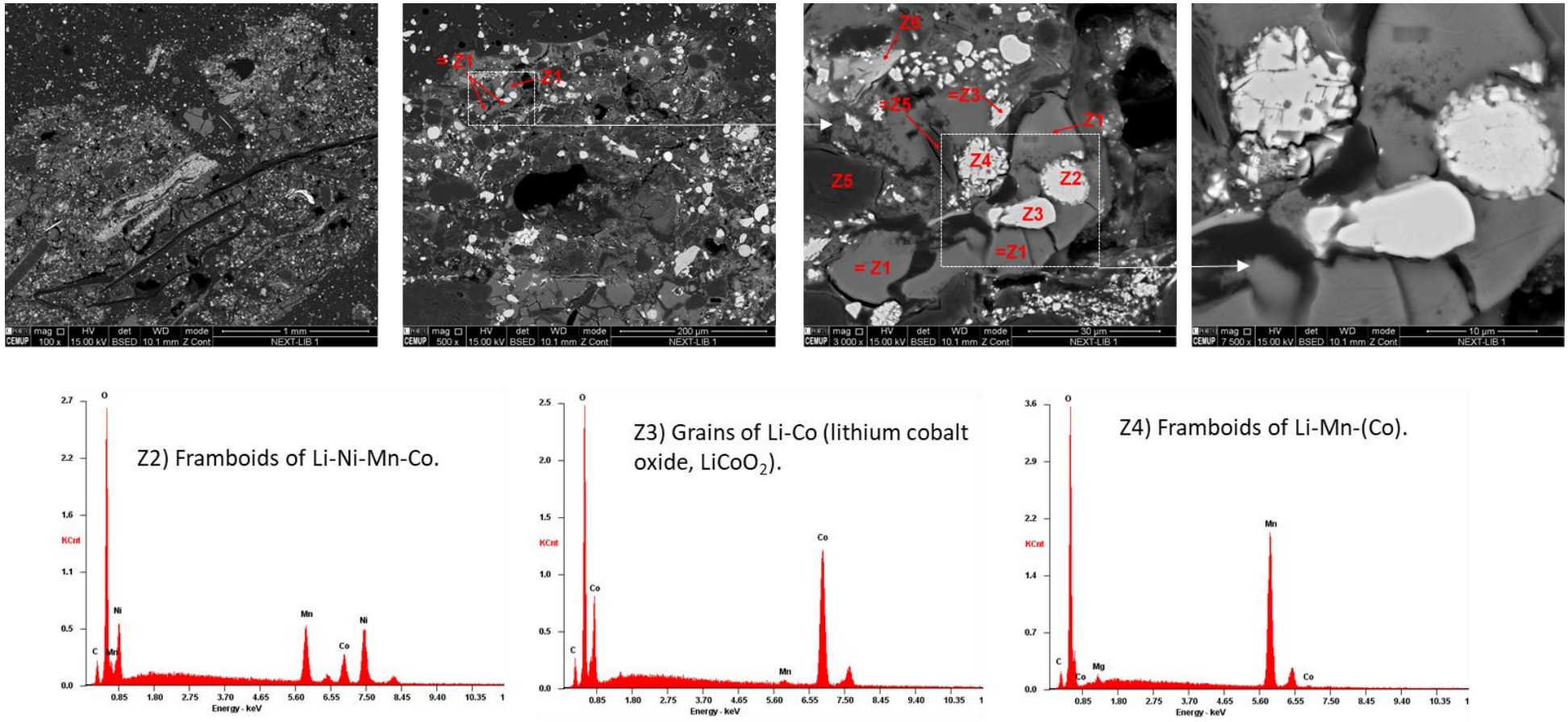


Figure S2. SEM-EDS analysis pressed lithium minerals observed in the >250µm size fraction of BM2, polished block