Supplementary Figure: Diffractogram of the XRD analyses showing the various mineral peaks and the difference plot between the actual measured plot vs the re-calculated diffractogram with an Rwp = 3,08%

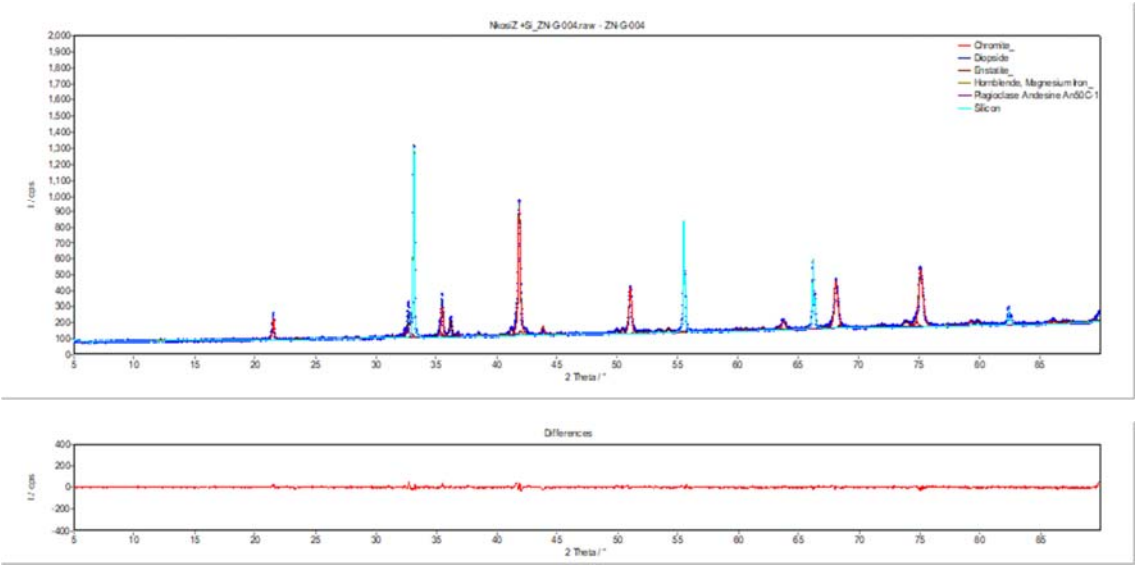

Table 1: Elemental composition (wt.%) of triplocate untreated mine tailings (MT) and reference materials by X-ray Fluorescence (XRF)

	MT-01	MT-02	MT-03	Reference Materials (reported Results)*	Reference Materials (measured results)
SiO_2	18.58	18.28	17.96	45.42	45.67
TiO_2	0.60	0.63	0.62	1.54	1.57
Al_2O_3	10.91	10.83	10.61	16.62	15.91
Fe_2O_3	22.42	22.97	22.14	9.73	10.09
MnO	0.30	0.30	0.29	0.18	0.18
MgO	12.48	12.82	11.93	8.15	7.72
CaO	1.85	1.89	1.76	10.93	10.64
Na_2O	0.27	0.30	0.28	3.65	3.70
K_2O	0.09	0.09	0.07	0.70	0.72
P_2O_3	0.01	0.02	0.01	0.26	0.25
Cr_2O_3	33.54	32.91	35.63	0.07	0.06
LOI	-1.38	-1.37	-1.33	2.50	2.76
Total	99.67	99.66	99.98	99.75	99.27

*CGS in-house reference materiala - Sample 12/76 of secondary amphibolite

Table 2: Mineralogical composition of representative untreated mine tailings (MT)

Mineral Phase	Abundance (%)	3 sigma
Chromite	40.62	0.87
Enstatite	29.43	1.71
Plagioclase	10.25	1.56
Hornblende	4.05	1.08
Diopside	3.13	0.78
Amorphous Content	12.53	2,88

Table 3: Carbon and sulphur analyses (wt. %) of the replicate fresh tailings (MT) and resultant reacted mine tailings (RMT) after 2 – 24 hrs (n = 3, A - C)

Sample	Reaction Time	Carbon (%)	Sulphur (%)
MT-01	n.a	0.70	0.06
MT-02	n.a	0.49	0.04
MT-03	n.a	0.68	0.07
MT-04	n.a	0.68	0.05
RMT-01A	2	0.64	0.02
RMT-01B	2	0.63	0.04
RMT-01C	2	0.58	0.02
RMT-02A	4	0.72	0.01
RMT-02B	4	0.70	0.01
RMT-02C	4	0.76	0.02
RMT-03A	8	0.15	<0.01
RMT-03B	8	0.15	0.01
RMT-03C	8	0.16	0.02
RMT-04A	24	0.19	0.03
RMT-04B	24	0.18	0.03
RMT-04C	24	0.18	0.02
<0,01	Value below detection limit of 0.01 % C or S		

n.a = Not applicable

Table 4: [NCE] Net CO_2-equivalent (wt %) calculated from the measured net carbon that was gained or lost during reaction experiments

Sample	Reaction Time	[IC] Initial Carbon*	[PRC] Post-reaction Carbon	[NC] Net Carbon (loss/gain)**	[NCE] Net CO_2-equivalent (wt %)***
RMT-01A	2	0.64	0.64	0.00	0.00
RMT-01B	2	0.64	0.63	0.00	-0.01
RMT-01C	2	0.64	0.58	-0.06	-0.23
RMT-02A	4	0.64	0.72	0.08	0.29
RMT-02B	4	0.64	0.70	0.06	0.21
RMT-02C	4	0.64	0.76	0.12	0.44
RMT-03A	8	0.64	0.15	-0.49	-1.79
RMT-03B	8	0.64	0.15	-0.48	-1.78
RMT-03C	8	0.64	0.16	-0.48	-1.76
RMT-04A	24	0.64	0.19	-0.45	-1.66
RMT-04B	24	0.64	0.18	-0.46	-1.69
RMT-04C	24	0.64	0.18	-0.46	-1.70

*Initical carbon calculated from arithemtic mean
MT-01 to MT-04 anaylyses (see Table 3)
**NC is the difference between the initical carbon and post-reaction carbon NC = [PRC]-[IC]
***NCE is calculted by multipying the NC with conversion factor of 3,67

Table 5: Particle Size Distribution (PSD) of the untreated and reacted tailings expressed in terms of volume percent (v. %) per unit particle size (µm).

Particle Size (µm)	MT (v. %)	RMT - 2hrs (v. %)	RMT - 4 hrs (v. %)	RMT - 8 hrs (v. %)	RMT- 24 hrs (v. %)
0.02	0.00	0.00	0.00	0.00	0.00
0.02244	0.00	0.00	0.00	0.00	0.00
0.025179	0.00	0.00	0.00	0.00	0.00
0.028251	0.00	0.00	0.00	0.00	0.00
0.031698	0.00	0.00	0.00	0.00	0.00
0.035566	0.00	0.00	0.00	0.00	0.00
0.039905	0.00	0.00	0.00	0.00	0.00
0.044774	0.00	0.00	0.00	0.00	0.00
0.050238	0.00	0.00	0.00	0.00	0.00
0.056368	0.00	0.00	0.00	0.00	0.00
0.063246	0.00	0.00	0.00	0.00	0.00
0.070963	0.00	0.00	0.00	0.00	0.00
0.079621	0.00	0.00	0.00	0.00	0.00
0.089337	0.00	0.00	0.00	0.00	0.00
0.100237	0.00	0.00	0.00	0.00	0.00
0.112468	0.00	0.00	0.00	0.00	0.00
0.126191	0.00	0.00	0.00	0.00	0.00
0.141589	0.00	0.00	0.00	0.00	0.00
0.158866	0.00	0.00	0.00	0.00	0.00
0.17825	0.00	0.00	0.00	0.00	0.00
0.2	0.00	0.00	0.00	0.00	0.00
0.224404	0.00	0.00	0.00	0.00	0.00
0.251785	0.00	0.00	0.00	0.00	0.00
0.282508	0.00	0.00	0.00	0.00	0.00
0.316979	0.02	0.01	0.01	0.02	0.02
0.355656	0.28	0.20	0.21	0.30	0.26
0.399052	0.51	0.41	0.43	0.55	0.51
0.447744	0.75	0.62	0.65	0.80	0.75
0.502377	0.97	0.81	0.86	1.05	0.99
0.563677	1.15	0.96	1.02	1.24	1.17
0.632456	1.27	1.07	1.14	1.38	1.31
0.709627	1.33	1.13	1.21	1.46	1.38
0.796214	1.34	1.13	1.22	1.48	1.40
0.893367	1.31	1.10	1.19	1.45	1.37
1.002374	1.24	1.04	1.14	1.39	1.32
1.124683	1.18	0.98	1.09	1.33	1.26
1.261915	1.13	0.93	1.05	1.28	1.22
1.415892	1.12	0.91	1.05	1.27	1.23
1.588656	1.15	0.94	1.10	1.30	1.28

1.782502	1.24	1.01	1.19	1.38	1.39
2	1.35	1.11	1.32	1.49	1.54
2.244037	1.48	1.24	1.47	1.62	1.71
2.517851	1.61	1.39	1.63	1.75	1.89
2.825075	1.73	1.54	1.79	1.87	2.06
3.169786	1.84	1.70	1.94	1.97	2.21
3.556559	1.93	1.86	2.07	2.05	2.33
3.990525	2.01	2.02	2.18	2.11	2.42
4.477442	2.07	2.18	2.27	2.16	2.48
5.023773	2.14	2.33	2.35	2.19	2.52
5.636766	2.20	2.48	2.41	2.22	2.53
6.324555	2.27	2.62	2.45	2.25	2.53
7.096268	2.35	2.75	2.50	2.28	2.52
7.962143	2.43	2.87	2.54	2.32	2.51
8.933672	2.53	2.97	2.58	2.37	2.50
10.023745	2.62	3.04	2.62	2.42	2.50
11.246826	2.72	3.09	2.66	2.47	2.50
12.619147	2.81	3.11	2.69	2.51	2.51
14.158916	2.89	3.10	2.72	2.55	2.53
15.886565	2.96	3.06	2.74	2.59	2.54
17.825019	3.00	2.99	2.74	2.61	2.55
20	3.02	2.90	2.75	2.62	2.57
22.440369	3.02	2.81	2.74	2.62	2.58
25.178508	3.00	2.72	2.73	2.62	2.60
28.250751	2.96	2.65	2.72	2.62	2.60
31.697864	2.91	2.59	2.72	2.62	2.60
35.565588	2.86	2.55	2.71	2.61	2.60
39.905246	2.79	2.53	2.69	2.59	2.57
44.774423	2.71	2.51	2.66	2.56	2.52
50.237729	2.60	2.48	2.61	2.51	2.43
56.367659	2.46	2.43	2.52	2.43	2.31
63.245553	2.28	2.33	2.39	2.30	2.15
70.962678	2.05	2.18	2.21	2.13	1.94
79.621434	1.78	1.98	1.98	1.92	1.71
89.336718	1.48	1.73	1.72	1.67	1.44
100.237447	1.16	1.44	1.43	1.40	1.17
112.468265	0.86	1.15	1.13	1.11	0.90
126.191469	0.57	0.87	0.84	0.84	0.65
141.589157	0.36	0.61	0.58	0.59	0.44
158.865647	0.16	0.40	0.38	0.39	0.27
178.250188	0.07	0.23	0.20	0.22	0.14
200	0.00	0.12	0.05	0.11	0.05
224.403691	0.00	0.06	0.00	0.04	0.01
251.785082	0.00	0.01	0.00	0.00	0.00
282.507509	0.00	0.00	0.00	0.00	0.00

316.978638	0.00	0.00	0.00	0.00	0.00
355.655882	0.00	0.00	0.00	0.00	0.00
399.052463	0.00	0.00	0.00	0.00	0.00
447.744228	0.00	0.00	0.00	0.00	0.00
502.377286	0.00	0.00	0.00	0.00	0.00
563.676586	0.00	0.00	0.00	0.00	0.00
632.455532	0.00	0.00	0.00	0.00	0.00
709.626778	0.00	0.00	0.00	0.00	0.00
796.214341	0.00	0.00	0.00	0.00	0.00
893.367184	0.00	0.00	0.00	0.00	0.00
1002.374467	0.00	0.00	0.00	0.00	0.00
1124.68265	0.00	0.00	0.00	0.00	0.00
1261.914689	0.00	0.00	0.00	0.00	0.00
1415.891569	0.00	0.00	0.00	0.00	0.00
1588.656469	0.00	0.00	0.00	0.00	0.00
1782.501876	0.00	0.00	0.00	0.00	0.00
2000	0.00	0.00	0.00	0.00	0.00