Supplementary information

Enhancing Arsenic Solidification/Stabilisation Efficiency of Metallurgical Slag-Based Green Mining Fill and Its Structure Analysis

Wei Gao [1,2,3], Zifu Li [1,2,3], Siqi Zhang [2,3,4,*], Yuying Zhang [2,3,4], Pingfeng Fu [2,3,4], Huifen Yang [2,3,4] and Wen Ni [2,3,4,*]

[1] School of Energy and Environmental Engineering, University of Science and Technology Beijing, Beijing 100083, China; 15201455635@163.com (W.G.); zifulee@aliyun.com (Z.L.)
[2] Key Laboratory of High-efficient Mining and Safety of Metal Mines, Ministry of Education, Beijing 100083, China
[3] Key Laboratory of Resource-oriented Treatment of Industrial Pollutants, Beijing 100083, China
[4] School of Civil and Resource Engineering, University of Science and Technology Beijing, Beijing 100083, China; yuying.zhang@polyu.edu.hk (Y.Z.); pffu@ces.ustb.edu.cn (P.F.); yanghf@ustb.edu.cn (H.Y.)
* Correspondence: zsq2017@ustb.edu.cn (S.Z.); niwen@ces.ustb.edu.cn (W.N.); Tel.: +86 186 0128 3010 (S.Z.).

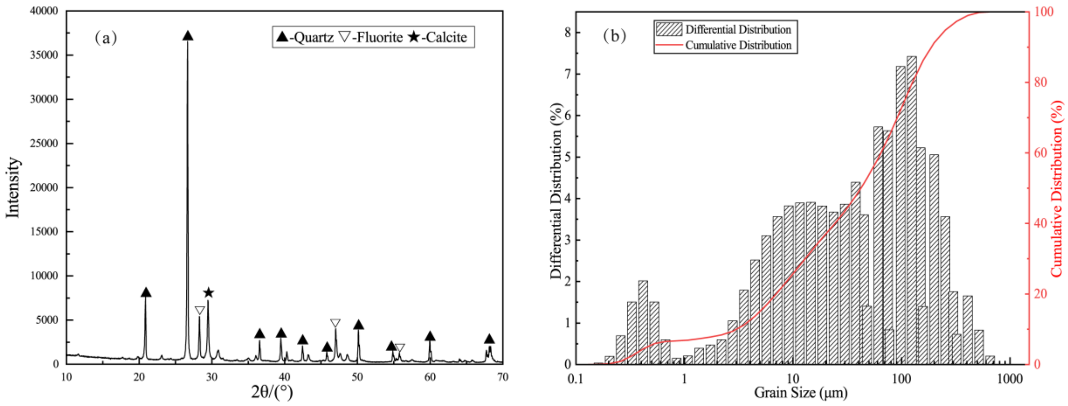


Figure S1. (a) XRD pattern and (b) grain size results of tailings.

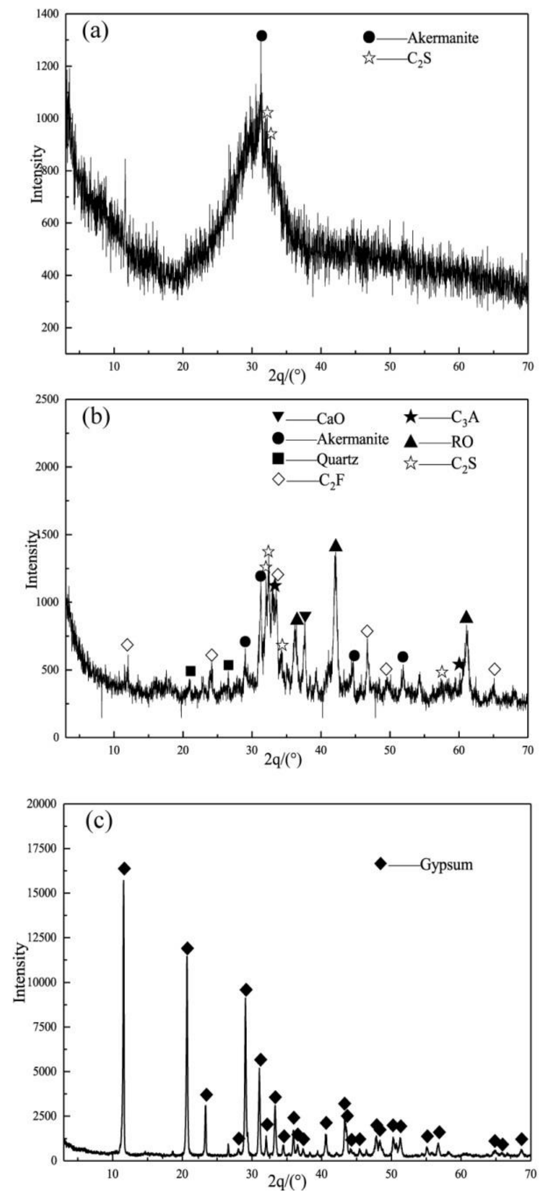
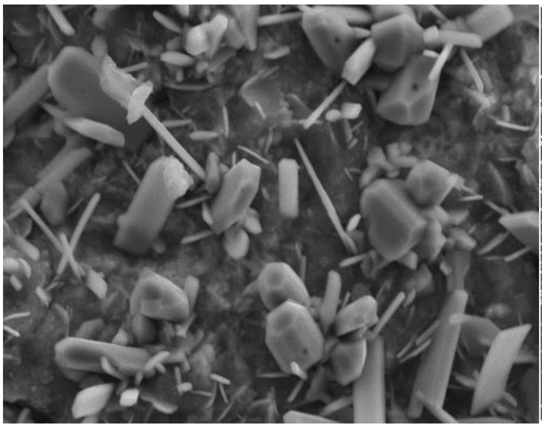
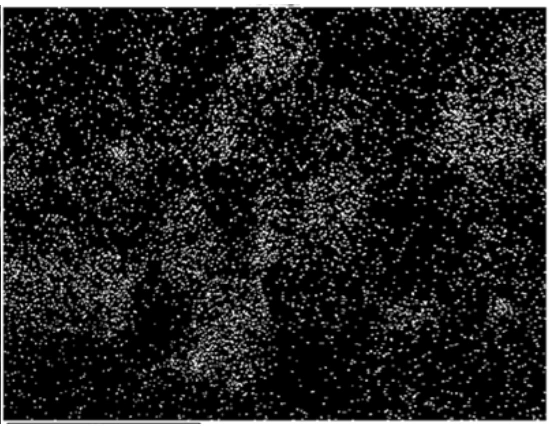


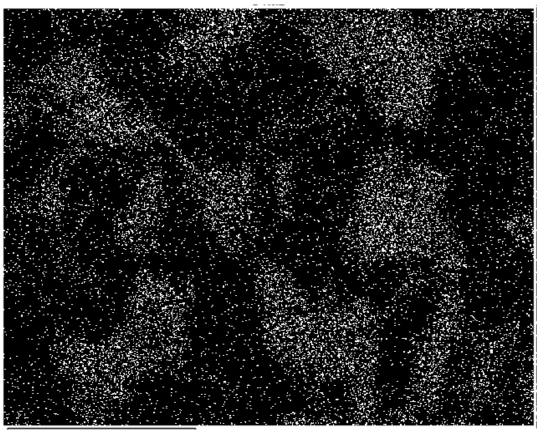
Figure S2. The XRD pattern of raw materials: (a) ground granulated blast furnace slag (GGBFS), C_2S: dicalcium silicate; (b) steel slag powder (SSP), C_3A: tricalcium aluminate, RO phase: $(MgO)_{0.239}(FeO)_{0.761}$, C_2S: dicalcium silicate, C_2F: dicalcium ferrite; (c) flue gas desulfurization gypsum (FGDG).



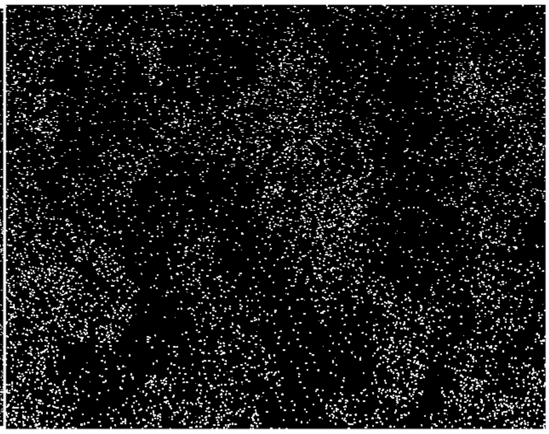
(a)



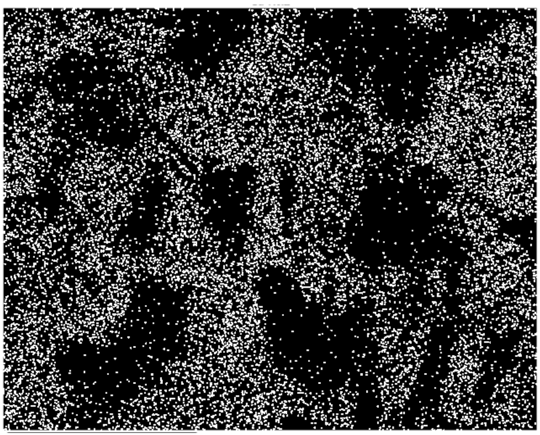
(b)As



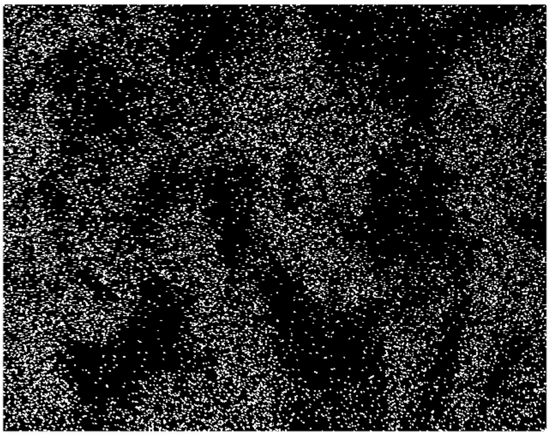
(c)S



(d)Al



(e)Ca



(f)Si

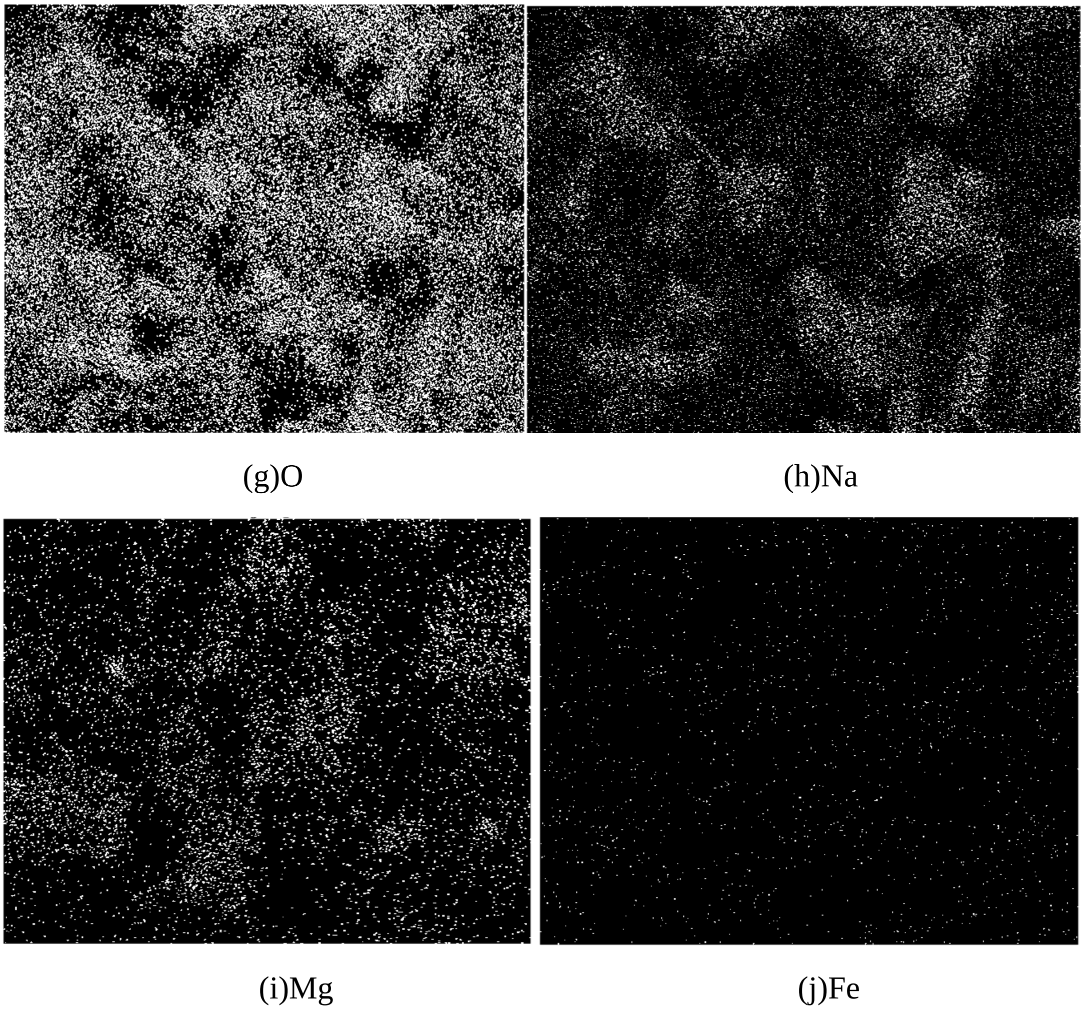


Figure S3. The SEM-EDS electron image and mapping images of Figure 4 (d).

T**able S1.** Leached concentration of raw materials and T in Table 2**.**

	Cr	Cu	Zn	As	Cd	Pb
Tailings[1]	6.54	154.20	1544	2098	2098.49	110.86
Tailings[2]	ND	ND	1.21	0.57	ND	0.007
GGBFS[2]	0.014	ND	ND	ND	ND	ND
SSP[2]	0.003	ND	0.004	ND	ND	ND
FGDG[2]	ND	ND	ND	ND	ND	ND
T[2]	ND	ND	0.02	0.031	ND	ND
Detection limit	0.001	0.001	0.001	0.004	0.0002	0.004

ND：not detected as the concentrations were below the method detection limit.

[1] The heavy metal concentrations of tailings according to the Chinese standard method HJ 803-2016 (mg/kg).

[2] The leaching heavy metal concentrations according to the Chinese standard method HJ 557-2010 (mg/L).

Table S2. Component analysis result of point in the Figure 4 (at%).

Notation	O	Na	Mg	Al	S	Ca	Si	As
b-1	69.02	1.36	2.81	4.55	3.25	11.53	5.2	-
b-2	68	1.31	0.93	5.15	7.13	15.11	2.28	-
b-3	59.93	1.37	0.91	6.17	7.91	18.68	3.72	-
c-1	54.79	28.28	-	0.62	13.37	1.85	1.09	-
c-2	49.14	21.28	0.75	1.53	10.29	11.5	-	0.55
c-3	53.25	28.33	-	1.05	14.1	1.92	1.36	-
d-1	49.66	32.53	-	-	17.81	-	-	0.61
d-2	51.13	33.48	-	-	15	-	-	-
d-3	42.82	28.16	1.4	1.36	10.99	2.42	2.21	-
e-1	48.9	13.08	1.88	3.98	10.41	16.08	4.81	0.86
e-2	55.43	10.22	3.38	3.45	8.63	10.99	6.01	1.88
e-3	52.33	25.59	-	0.6	13.55	5.08	2.12	0.72
e-4	46.37	1.73	--	0.91	6.74	1.52	25.08	16.3
f-1	68.4	-	-	4.16	7.11	17.5	1.04	0.94
f-2	67.44	-	-	5.48	7.27	14.69	1.58	3.48
f-3	46.77	31.94	-	0.09	19.83	1.37	-	-

Table S3. Component analysis result of point in the Figure 5 (at%).

Notation	O	Na	Mg	Al	S	Ca	Si	As
c-1	59.72	4.42	1.63	1.92	1.22	28.85	1.16	1.08
d-1	50.74	27.46	0.24	0.94	10.93	4.57	2.49	0.61
d-2	49.5	30.15	2.02	1.84	10.11	3.62	2.75	0.84
e-1	65.55	3.25	0.61	5.87	3.71	15.62	3.56	1.54
e-2	68.46	1.76	-	8.29	5.27	15.67	-	0.55

Table S4. Assessment summary of S/S performance effects of Na_2SO_4, NaOH, $Ca(NO_3)_2$ and $Ca(OH)_2$ at different doses (wt%).

Curing	Na_2SO_4			NaOH			$Ca(NO_3)_2$			$Ca(OH)_2$		
28d	5%	10%	15%	5%	10%	15%	5%	10%	15%	5%	10%	15%
UCS (%)	−1.8	−11	−23.3	−7.5	−66.2	−77.3	−1.2	−13.5	−28.2	+5.5	+19.6	+25.7
Curing Rate (%)	−7.2	−8.4	−14.7	−17.7	−31.4	−73.8	−3.1	−6	−9.1	+2.8	+5.3	+5.8
pH (%)	−0.7	−0.5	−0.6	+11.5	+12.4	+15.8	−0.6	−0.7	−0.5	+0.5	+1.6	+4.6

"+": increased; "–": decreased.