minerals

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Article

Supplementary Materials: Characterization and Toxicity Analysis of Lab Created Respirable Coal Mine Dust from the Appalachians and Rocky Mountains Regions

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1. Supplementary Information

The following supporting information is provided in the current document, Table S1: Composition of the SLFs used; Table S2: Percentages of the relative mineral abundance, total counts, and counts per mineral in XRD data; Table S3: SRM verification (µg/g); Table S4. Percentage dissolves from the initial availability of the elements (dissolved/available); Figure S1. Elemental content of the sample in same scale; Figure S2. Mass and surface area normalized dissolution of metals as a function of time in GS from (a) Mine 1, (b) Mine 2, (c) Mine 3, (d) Mine 4, and (e) Mine 5; Figure S3. Mass and surface area normalized dissolution of metals as a function of time in ALF from (a) Mine 1, (b) Mine 2, (c) Mine 3, (d) Mine 4, and (e) Mine 5.

Table S1. Composition of the SLFs used [9,22].

Composition	Gamble Solution (GS)	Artificial Lysosomal Fluid (ALF)
	g/L	g/L
NaCl	6.779	3.21
Na_2HPO_4	-	0.071
$NaHCO_3$	2.268	-
Sodium citrate dehydrate	0.055	0.077
NH_4Cl	0.535	-
Glycine	0.375	0.059
NaH_2PO_4	1.872	-
L-Cysteine	0.121	-
NaOH	-	6
Citric acid	-	20.8
$CaCl_2.2H_2O$	0.026	0.128
Na_2SO_4	-	0.039
$MgCl_2.6H_2O$	-	0.05
Disodium tartrate	-	0.09
Sodium lactate	-	0.085
Sodium pyruvate	-	0.172

Table S2. Percentages of the relative mineral abundance, total counts, and counts per mineral in XRD data.

Mineral	Counts of major peak					Peak position (°2θ)
	Mine 1	Mine 2	Mine 3	Mine 4	Mine 5	
Quartz	2167.11	1316.02	3266.8	1626.2	564.32	26.65°
Kaolinite	341.11	394.53	697.91	609.89	312.64	12.38°
Pyrite	885.48	81.46	657.47	942.21	0	33.04°
Siderite	0	81.53	0	0	0	32.02°
Calcite	0	0	138	0	0	29.44°

Table S3. SRM verification (μg/g).

Element	Li	Mg	Al	Si	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	As	Ba	Pb
SRM CLB-1 Digested	5.7	157.5	6815	10465	440	1095	452	12.24	9.29	8.4	8309.6	18.1	8.5	13.6	31.6	5.1
SRM CLB-1 Information	8.0	279.133	7991	11734	631	1572	467	12.0	9.70	8.0	8742.5	18.0	10.0	13.000	34.000	5.100
Allowable error	N.R.	18	212	982	41.5	71.5	18	1	1.2	N.R.	350	2	N.R.	N.R.	5.000	0.700
Difference	2.31	122	1176	1269	191	477	15.45	-0.24	0.41	-0.4	432.9	-0.10	1.52	-0.56	2.371	0.033
Relative difference (%)	29%	44%	15%	11%	30%	30%	3%	-2%	4%	-4%	5%	-1%	15%	-4%	7%	1%

Table S4. Percentage dissolves from the initial availability of the elements (dissolved/available).

Mine ID	Al		Si		Fe		Cu		Sr		Pb	
	ALF	GS	ALF	GS	ALF	GS	ALF	GS	ALF	GS	ALF	GS
Mine 1	0.0350%	0.0022%	0.0284%	0.4745%	0.0902%	-	1.4014%	1.5558%	0.0652%	-	0.7853%	-
Mine 2	0.0283%	0.0076%	0.0259%	0.4793%	0.4076%	0.0004%	3.7256%	5.9179%	1.8139%	-	0.4677%	-
Mine 3	0.0347%	0.0023%	0.0130%	0.1131%	0.0893%	-	1.7373%	1.2010%	0.4585%	-	0.2867%	-
Mine 4	0.0187%	0.0045%	0.0156%	0.2055%	0.1443%	0.0028%	2.3777%	5.7885%	0.1566%	-	0.2586%	-
Mine 5	0.0376%	0.0025%	0.0306%	1.4618%	0.1309%	-	1.4431%	2.3560%	0.2687%	-	0.5321%	-

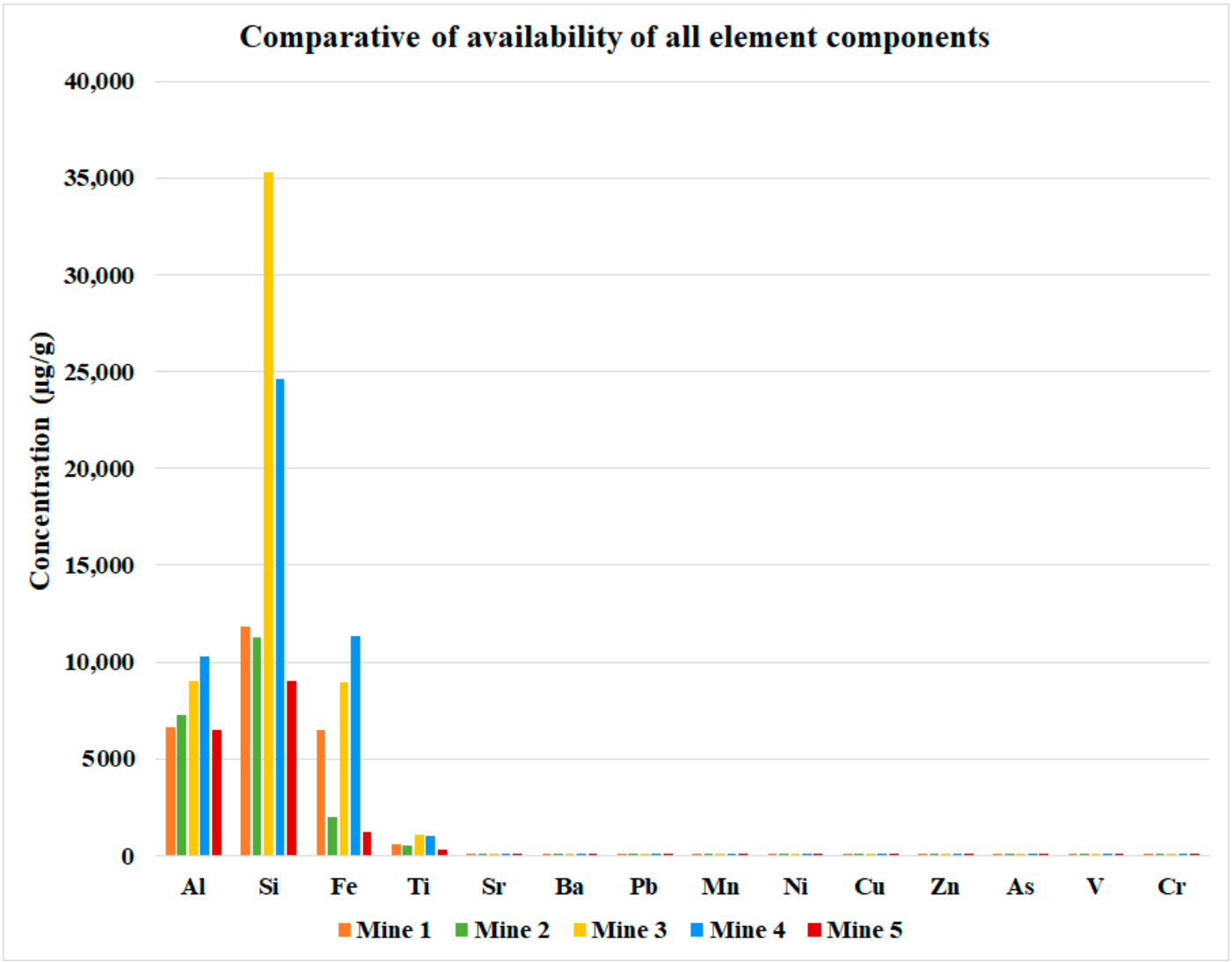

Figure S1. Elemental content of the sample in same scale.

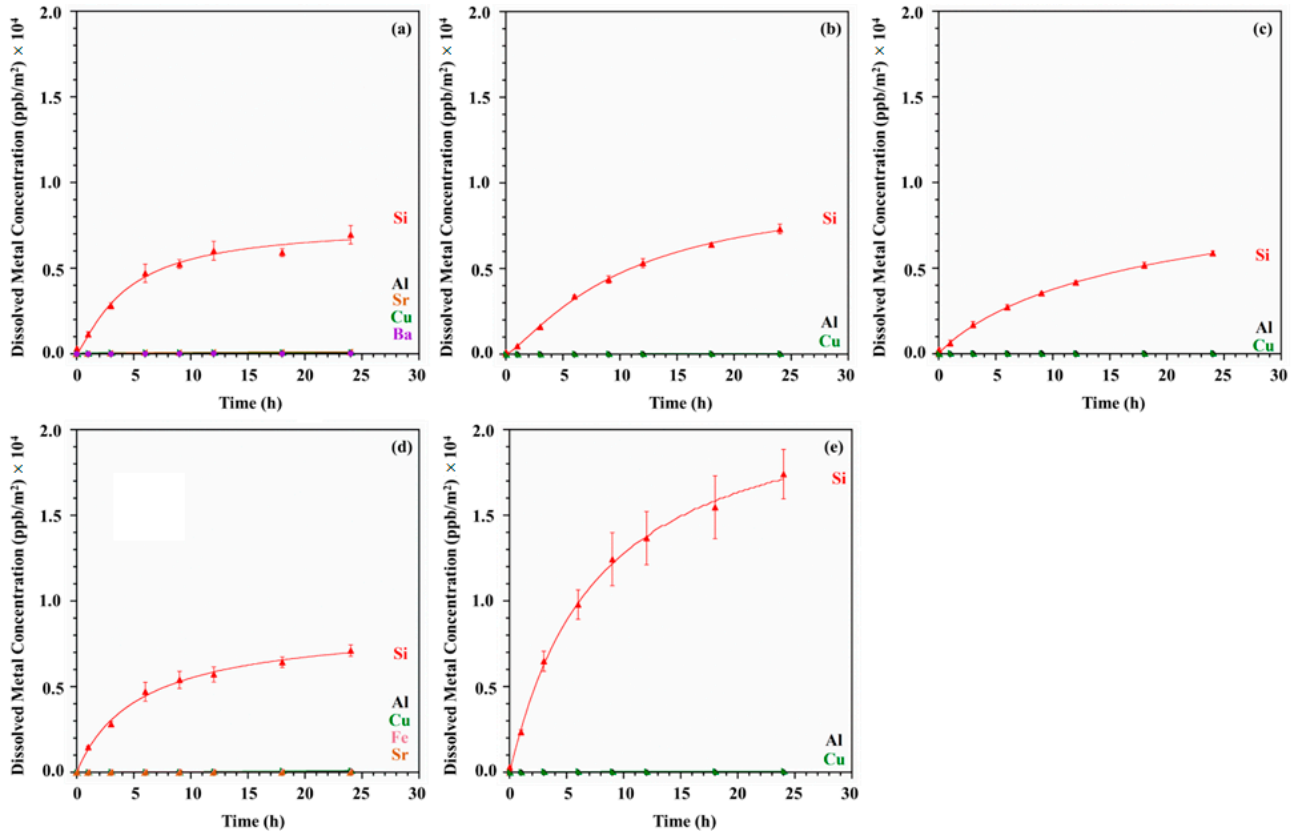

Figure S2. Mass and surface area normalized dissolution of metals as a function of time in GS from (a) Mine 1, (b) Mine 2, (c) Mine 3, (d) Mine 4, and (e) Mine 5.

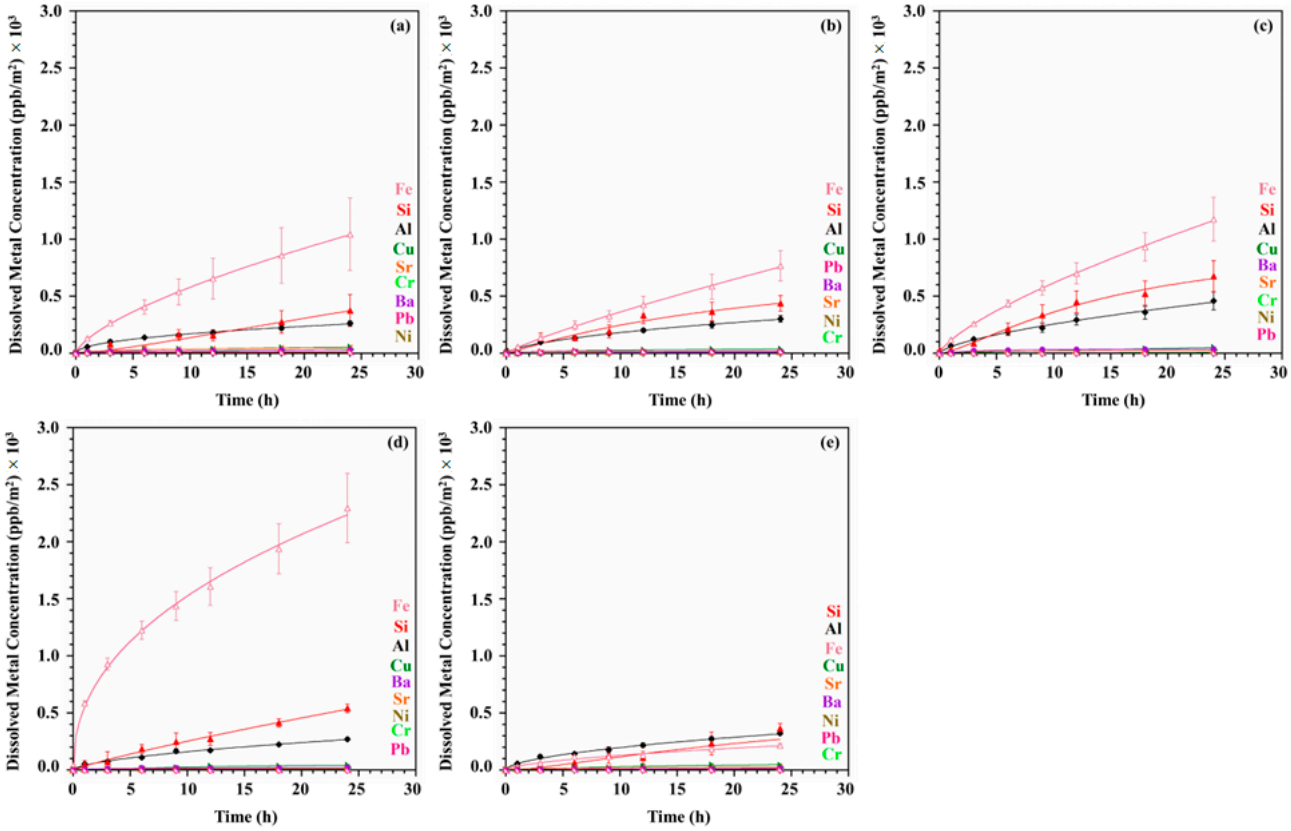

Figure S3. Mass and surface area normalized dissolution of metals as a function of time in ALF from (a) Mine 1, (b) Mine 2, (c) Mine 3, (d) Mine 4, and (e) Mine 5.