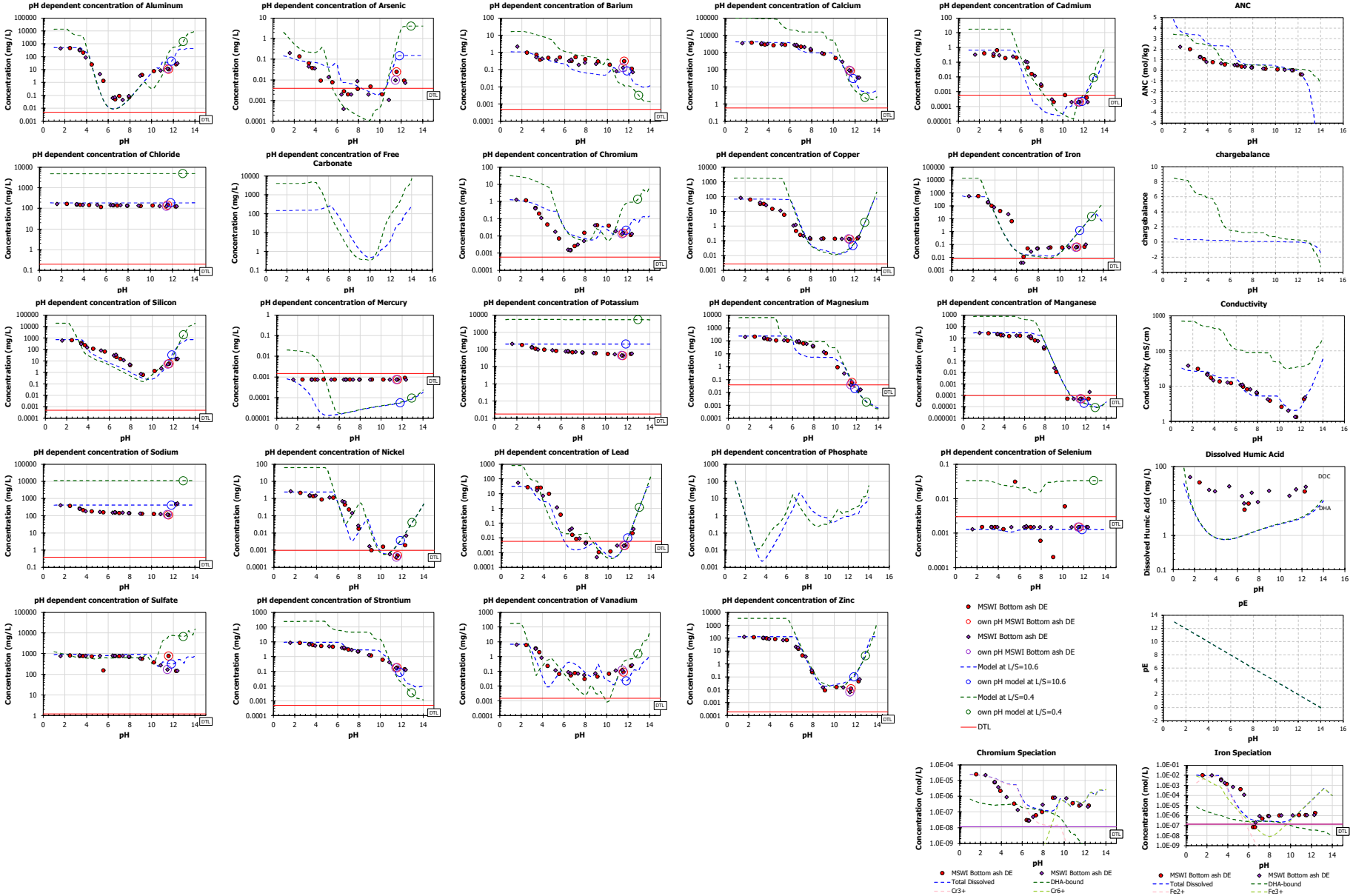
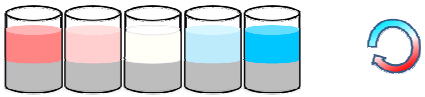
MSWI BOTTOM ASH DE

COMPARISON pH DEPENDENCE WITH MODEL



Object pH Dependent Leaching Test Model
Name MSWI Bottom ash DE

pH Dependent Leaching Test Scenario



Lab Test

Extra L/S Simulation

Lab Test

Model Parameters

Entity	Unit	Default
c0		-3.401
c1		-1.683
c2		0.3256
c3		-0.02570
c4		0.0007423
c5		-2.906E-07
Clay	mg/kg	3000
Hydrous Ferric Oxide	mg/kg	150.0
L/S	L/kg	10.60
pE		2.400
pH		11.56
Solid Humic Acid	mg/kg	500.0
Simulated Low L/S	L/kg	0.4000

Available Content

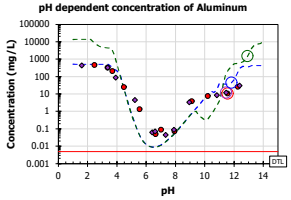
Entity	mg/kg	Entity	mg/kg	Entity	mg/kg
Acetic acid	2.220E-08	B	1.081E-09	Sb	1.218E-08
Al	5437	Si	7712	Se	0.01345
As	1.635	Hg	0.009140	Sn	1.187E-08
Ba	11.56	K	2179	SO4	9554
Ca	4.348E+04	Li	6.941E-10	Sr	99.16
Cd	6.997	Mg	2528	V	72.44
Cl	1973	Mn	299.0	Zn	1371
Co	5.893E-09	Mo	9.594E-09		
CO32-	5.000E+04	Na	4417		
Cr	13.89	Ni	25.39		
Cu	729.6	Pb	324.6		
F	1.900E-09	PO4	2300		
Fe	6841				

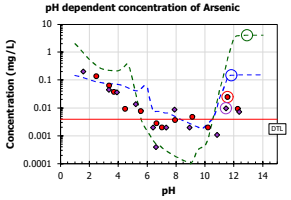
Solid Solutions

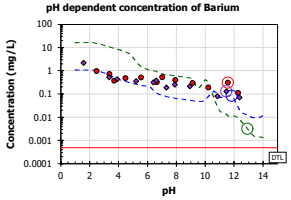
Name	End Member	Log(K)	Reaction
CSHii_ss	Cem07_Jenn_ss	-7.799	Cem07_Jenn_ss + 1.33333 H+ -> 1 CSHii_ss + 1.66667 Ca+2 + 1.76667 H2O + 1 H2SiO4-2
	Cem07_Tob_II_ss	10.36	Cem07_Tob_II_ss -> 1 CSHii_ss + 0.83333 Ca+2 + 0.33333 H+ + 0.16667 H2O + 1 H2SiO4-2
ettr_ss	AsO4_Ettringite_ss	26.79	AsO4_Ettringite_ss + 1 H+ + 8 H2O -> 2 Al[OH]4- + 3 AsO4-3 + 6 Ca+2 + 1 ettr_ss
	Ba_Ettringite_ss	4.008	Ba_Ettringite_ss + 4 H+ + 8 H2O -> 2 Al[OH]4- + 6 Ba+2 + 3 SO4-2 + 1 ettr_ss
	BO3_Ettringite_ss	-46.87	BO3_Ettringite_ss + 7 H+ + 8 H2O -> 2 Al[OH]4- + 6 Ca+2 + 3 H2BO3- + 1 ettr_ss
	CrO4_Ettringite_ss	-8.592	CrO4_Ettringite_ss + 4 H+ + 8 H2O -> 2 Al[OH]4- + 6 Ca+2 + 3 CrO4-2 + 1 ettr_ss
	Ettringite_ss	-10.99	Ettringite_ss + 4 H+ + 8 H2O -> 2 Al[OH]4- + 6 Ca+2 + 3 SO4-2 + 1 ettr_ss
	MoO4_Ettringite_ss	-9.592	MoO4_Ettringite_ss + 4 H+ + 8 H2O -> 2 Al[OH]4- + 6 Ca+2 + 3 MoO4-2 + 1 ettr_ss
	PO4_Ettringite_ss	39.10	PO4_Ettringite_ss + 1 H+ + 8 H2O -> 2 Al[OH]4- + 6 Ca+2 + 3 PO4-3 + 1 ettr_ss
	SeO4-2_Ettringite_ss	-8.592	SeO4-2_Ettringite_ss + 4 H+ + 8 H2O -> 2 Al[OH]4- + 6 Ca+2 + 3 SeO4-2 + 1 ettr_ss
	Sr_Ettringite_ss	4.008	Sr_Ettringite_ss + 4 H+ + 8 H2O -> 2 Al[OH]4- + 3 SO4-2 + 6 Sr+2 + 1 ettr_ss
	VO3_Ettringite_ss	-53.79	VO3_Ettringite_ss + 13 H+ + 2 H2O -> 2 Al[OH]4- + 6 Ca+2 + 3 VO2+ + 1 ettr_ss

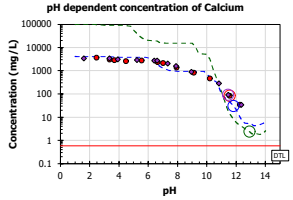
Minerals

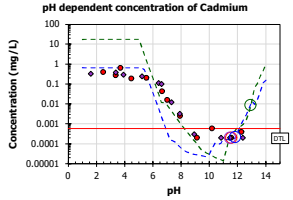
Name	Log(K)	Reaction
AA_Fe[OH]3[am]	16.60	AA_Fe[OH]3[am] + 1 H2O -> 1 Fe[OH]4- + 1 H+
Adamite-therm	12.64	Adamite-therm + 1 H+ -> 1 AsO4-3 + 1 H2O + 2 Zn+2
alpha-TCP	25.50	alpha-TCP -> 3 Ca+2 + 2 PO4-3
Austinite-therm	11.47	Austinite-therm + 1 H+ -> 1 AsO4-3 + 1 Ca+2 + 1 H2O + 1 Zn+2
Ba[SCr]O4[96%SO4]	9.790	Ba[SCr]O4[96%SO4] -> 1 Ba+2 + 0.04 CrO4-2 + 0.96 SO4-2
BaSrSO4[50%Ba]	8.221	BaSrSO4[50%Ba] -> 0.5 Ba+2 + 1 SO4-2 + 0.5 Sr+2
Ca2Cd[PO4]2	32.95	Ca2Cd[PO4]2 -> 2 Ca+2 + 1 Cd+2 + 2 PO4-3
Ca3[OH]2[CrO4]2[ccc]	1.000	Ca3[OH]2[CrO4]2[ccc] + 2 H+ -> 3 Ca+2 + 2 CrO4-2 + 2 H2O
Ca4Cd[PO4]3OH	39.23	Ca4Cd[PO4]3OH + 1 H+ -> 4 Ca+2 + 1 Cd+2 + 1 H2O + 3 PO4-3
Ca5[OH][VO4]3[cx]	-54.00	Ca5[OH][VO4]3[cx] + 13 H+ -> 5 Ca+2 + 7 H2O + 3 VO2+
CaCO3_SrCO3	19.85	CaCO3_SrCO3 -> 2 CO3-2 + 1 Ca+2 + 1 Sr+2
Cd[OH]2[C]	-13.65	Cd[OH]2[C] + 2 H+ -> 1 Cd+2 + 2 H2O
CdHPO4	26.48	CdHPO4 -> 1 Cd+2 + 1 H+ + 1 PO4-3
Cem07_Al[OH]3[am]	13.76	Cem07_Al[OH]3[am] + 1 H2O -> 1 Al[OH]4- + 1 H+
Cem07_Brucite	-16.83	Cem07_Brucite + 2 H+ -> 2 H2O + 1 Mg+2
Cem07_C3AH6	-35.14	Cem07_C3AH6 + 4 H+ -> 2 Al[OH]4- + 3 Ca+2 + 4 H2O
Cem07_C3FH6	-30.82	Cem07_C3FH6 + 4 H+ -> 3 Ca+2 + 2 Fe[OH]4- + 4 H2O
Cem07_CAH10	7.505	Cem07_CAH10 -> 2 Al[OH]4- + 1 Ca+2 + 6 H2O
Cem07_Calcite	8.485	Cem07_Calcite -> 1 CO3-2 + 1 Ca+2
Cem07_Gypsum	4.583	Cem07_Gypsum -> 1 Ca+2 + 2 H2O + 1 SO4-2
Cr[OH]3[A]	68.13	Cr[OH]3[A] + 1 H2O -> 1 CrO4-2 + 5 H+ + 3 e-
Cu[OH]2[s]	-8.640	Cu[OH]2[s] + 2 H+ -> 1 Cu+2 + 2 H2O
Exp_CaCO3_MgCO3	19.00	Exp_CaCO3_MgCO3 -> 2 CO3-2 + 1 Ca+2 + 1 Mg+2
Exp2_LDH_Pb_zc	61.00	Exp2_LDH_Pb_zc + 1 H2O -> 1 Al[OH]4- + 3 CO3-2 + 1 H+ + 3 Pb+2
Laumontite	118.0	Laumontite + 8 H2O -> 2 Al[OH]4- + 1 Ca+2 + 8 H+ + 4 H2SiO4-2
Manganite	-25.27	Manganite + 3 H+ + 1 e- -> 2 H2O + 1 Mn+2
Ni[OH]2[s]	-10.80	Ni[OH]2[s] + 2 H+ -> 2 H2O + 1 Ni+2
NiHPO4	25.00	NiHPO4 -> 1 H+ + 1 Ni+2 + 1 PO4-3
Pb[OH]2[C]	-8.150	Pb[OH]2[C] + 2 H+ -> 2 H2O + 1 Pb+2
Pb2V2O7	0.9500	Pb2V2O7 + 3 H+ -> 1.5 H2O + 1 Pb+2 + 1 VO2+
Pb3[VO4]2	-3.070	Pb3[VO4]2 + 4 H+ -> 2 H2O + 1.5 Pb+2 + 1 VO2+
Rhodochrosite	10.41	Rhodochrosite -> 1 CO3-2 + 1 Mn+2
Strengite	48.00	Strengite + 2 H2O -> 1 Fe[OH]4- + 4 H+ + 1 PO4-3
Willemite	6.289	Willemite + 2 H+ -> 1 H2SiO4-2 + 2 Zn+2

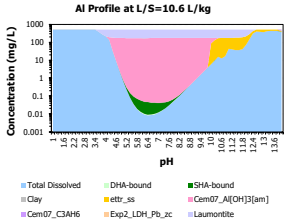

pH dependent concentration of Aluminum
Concentration (mg/L)
pH

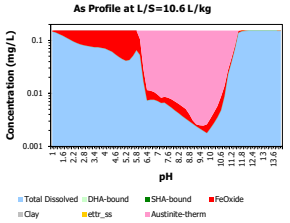

pH dependent concentration of Arsenic
Concentration (mg/L)
pH

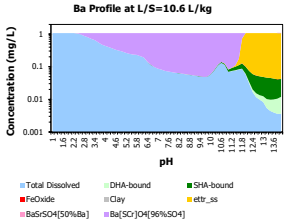

pH dependent concentration of Barium
Concentration (mg/L)
pH

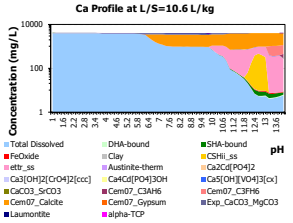

pH dependent concentration of Calcium
Concentration (mg/L)
pH

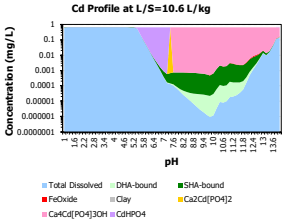

pH dependent concentration of Cadmium
Concentration (mg/L)
pH

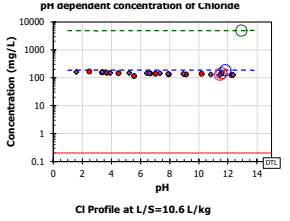

Al Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
Clay
ettr_ss
Cem07_Al[OH]3[am]
Cem07_C3AH6
Exp2_LDH_Pb_zc
Laumontite

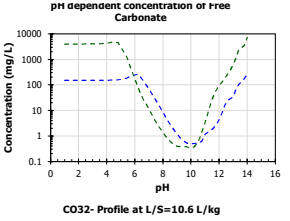

As Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
ettr_ss
Austinite-therm

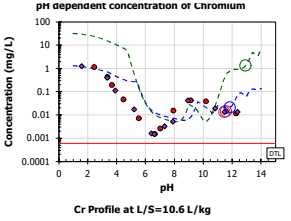

Ba Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
ettr_ss
BaSrSO4[50%Ba]
Ba[SCr]O4[96%SO4]

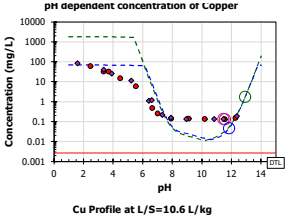

Ca Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
CSHii_ss
ettr_ss
Austinite-therm
Ca2Cd[PO4]2
Ca3[OH]2[CrO4]2[ccc]
Ca4Cd[PO4]3OH
Ca5[OH][VO4]3[cx]
CaCO3_SrCO3
Cem07_C3AH6
Cem07_C3FH6
Cem07_Calcite
Cem07_Gypsum
Exp_CaCO3_MgCO3
Laumontite
alpha-TCP

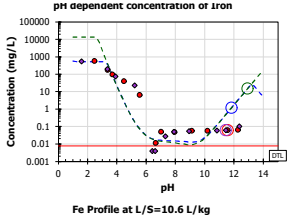

Cd Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
Ca2Cd[PO4]2
Ca4Cd[PO4]3OH
CdHPO4

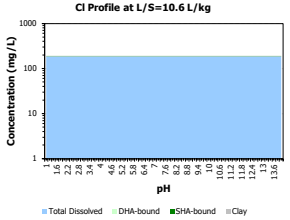

pH dependent concentration of Chloride
Concentration (mg/L)
pH

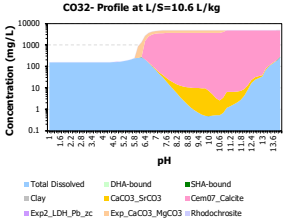

pH dependent concentration of Free Carbonate
Concentration (mg/L)
pH

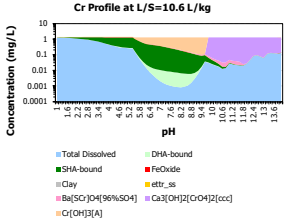

pH dependent concentration of Chromium
Concentration (mg/L)
pH

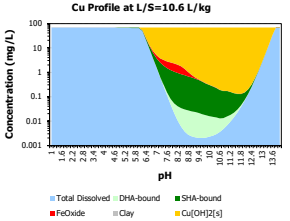

pH dependent concentration of Copper
Concentration (mg/L)
pH

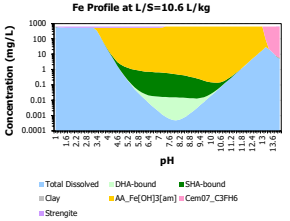

pH dependent concentration of Iron
Concentration (mg/L)
pH

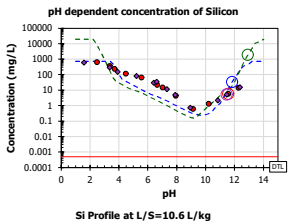

Cl Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
Clay

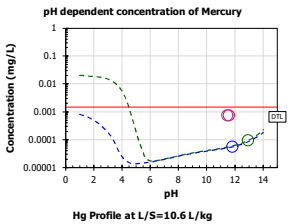

CO32- Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
Clay
CaCO3_SrCO3
Cem07_Calcite
Exp2_LDH_Pb_zc
Exp_CaCO3_MgCO3
Rhodochrosite

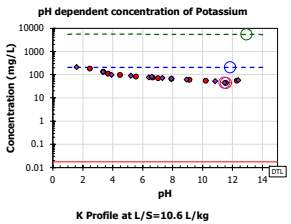

Cr Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
ettr_ss
Ba[SCr]O4[96%SO4]
Ca3[OH]2[CrO4]2[ccc]
Cr[OH]3[A]

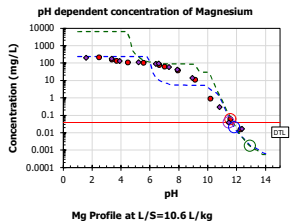

Cu Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
Cu[OH]2[s]

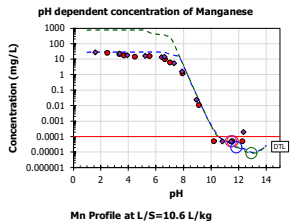

Fe Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
Clay
AA_Fe[OH]3[am]
Cem07_C3FH6
Strengite

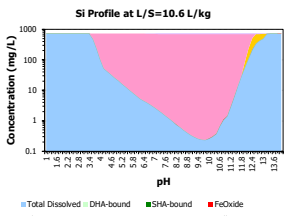

pH dependent concentration of Silicon
Concentration (mg/L)
pH

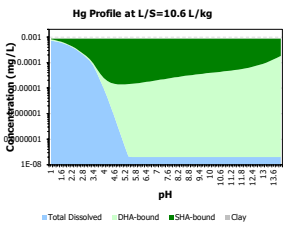

pH dependent concentration of Mercury
Concentration (mg/L)
pH

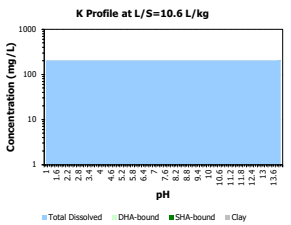

pH dependent concentration of Potassium
Concentration (mg/L)
pH

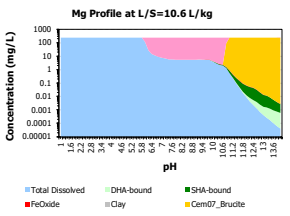

pH dependent concentration of Magnesium
Concentration (mg/L)
pH

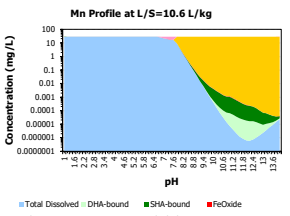

pH dependent concentration of Manganese
Concentration (mg/L)
pH

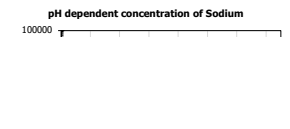

Si Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
CSHii_ss
Laumontite
Willemite

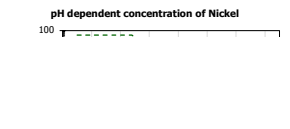

Hg Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
Clay

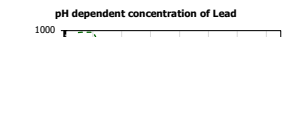

K Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
Clay

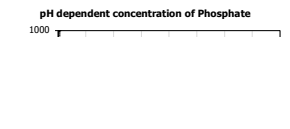

Mg Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
Cem07_Brucite
Exp_CaCO3_MgCO3

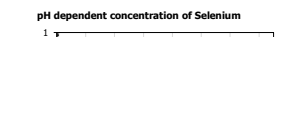

Mn Profile at L/S=10.6 L/kg
Concentration (mg/L)
pH
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
Manganite
Rhodochrosite

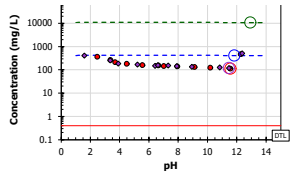

pH dependent concentration of Sodium

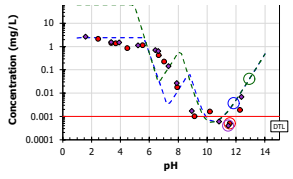

pH dependent concentration of Nickel

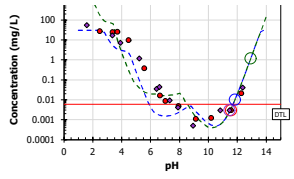

pH dependent concentration of Lead

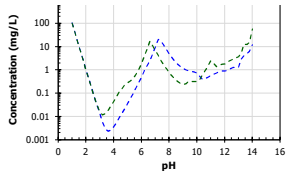

pH dependent concentration of Phosphate

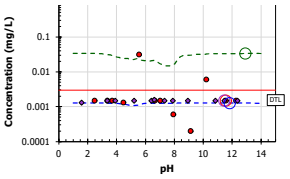

pH dependent concentration of Selenium



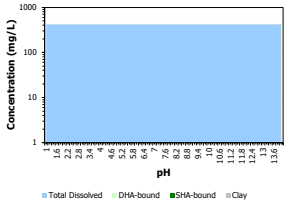




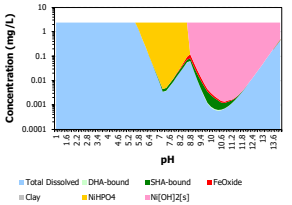




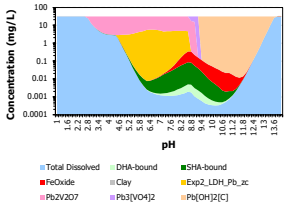
Na Profile at L/S=10.6 L/kg



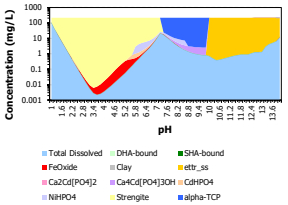
Ni Profile at L/S=10.6 L/kg



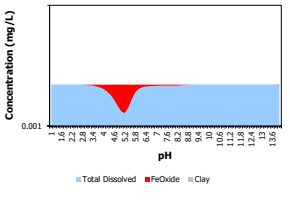
Pb Profile at L/S=10.6 L/kg



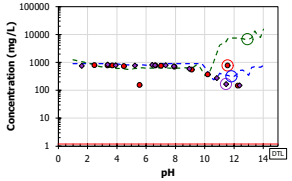
PO4 Profile at L/S=10.6 L/kg



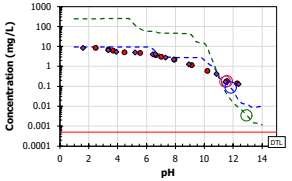
Se Profile at L/S=10.6 L/kg



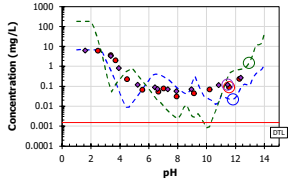
pH dependent concentration of Sulfate



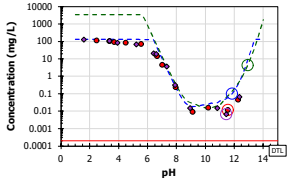
pH dependent concentration of Strontium



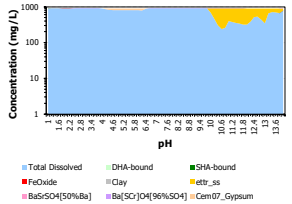
pH dependent concentration of Vanadium



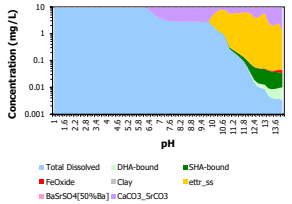
pH dependent concentration of Zinc



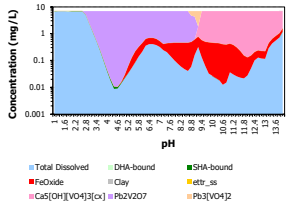
SO4 Profile at L/S=10.6 L/kg



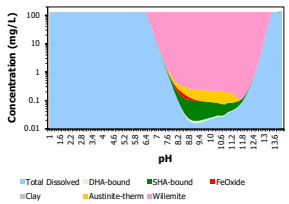
Sr Profile at L/S=10.6 L/kg



V Profile at L/S=10.6 L/kg



Zn Profile at L/S=10.6 L/kg



Model Comparison: residuals - Concentration

Name **MSWI Bottom ash DE**

Legend

Total Average Deviation Square root of the sum of the squared values of residuals divided by the number of values, over the entire X range.
User Average Deviation Square root of the sum of the squared values of residuals divided by the number of values, over the user defined X range.
Fractional Average Devi Square root of the sum of the squared values of residuals divided by the number of values, over the fraction.
Note that the Total and User Average Deviation columns are averages as well.

Residual details, concentrations

Residuals as log(model/sample)

Fraction	*9*	*8*	*7*	*6*	*1*	*11*	*10*	*4*	*3*	*2*	*5*	*12*	*Total Avg*
pH	*2.47*	*3.36*	*3.69*	*4.48*	*5.55*	*6.65*	*7.02*	*7.93*	*9.12*	*10.2*	*11.6*	*12.3*	*Deviation*
Al	0.05	0.19	0.20	-0.07	-1.49	-0.72	-0.86	-0.10	-0.68	0.11	0.54	0.88	0.19
As	-0.19	0.07	0.30	0.80	0.80	0.43	0.55	0.13	-0.28	0.14	0.70	1.22	0.17
Ba	0.03	-0.03	0.14	-0.14	-0.32	-0.47	-0.79	-0.79	-0.75	-0.40	-0.57	-0.59	0.14
Br	-	-	-	-	-	-	-	-	-	-	-	-	-
Ca	0.05	0.14	0.15	0.17	0.14	-0.11	-0.21	-0.15	0.06	0.06	-0.26	-0.54	0.06
Cd	0.22	0.38	0.02	0.54	0.12	-1.37	-1.65	-1.56	-0.85	-1.00	-0.08	0.41	0.26
Cl	0.05	0.08	0.09	0.11	0.21	0.12	0.13	0.15	0.15	0.13	0.10	0.17	0.04
Co	-	-	-	-	-	-	-	-	-	-	-	-	-
CO32-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cr	-0.07	0.23	0.46	0.86	1.34	0.93	0.59	-0.33	-0.71	-0.28	0.15	0.68	0.19
Cu	0.05	0.32	0.32	0.66	1.04	1.18	0.76	-0.36	-0.77	-0.97	-0.67	0.03	0.20
F	-	-	-	-	-	-	-	-	-	-	-	-	-
Fe	-0.05	0.31	-0.05	-1.15	-1.93	0.20	-0.49	-0.51	-0.65	-0.23	1.02	1.71	0.27
B	-	-	-	-	-	-	-	-	-	-	-	-	-
Si	0.05	0.31	0.15	-0.48	-0.77	-0.75	-0.74	-0.63	-0.29	-0.62	0.32	1.02	0.17
Hg	-0.35	-0.87	-1.21	-1.69	-1.71	-1.61	-1.57	-1.47	-1.35	-1.27	-1.16	-1.14	0.39
K	0.05	0.18	0.27	0.33	0.39	0.43	0.47	0.49	0.54	0.58	0.67	0.58	0.13
Li	-	-	-	-	-	-	-	-	-	-	-	-	-
Mg	0.05	0.18	0.25	0.35	0.37	-0.87	-0.93	-0.83	-0.31	0.52	-0.04	-0.37	0.15
Mn	0.05	0.14	0.22	0.29	0.26	0.45	0.55	0.61	0.30	0.75	-0.24	-0.48	0.12
Mo	-	-	-	-	-	-	-	-	-	-	-	-	-
Na	0.05	0.20	0.29	0.36	0.42	0.43	0.46	0.47	0.50	0.52	0.56	-0.05	0.11
Ni	0.05	0.22	0.24	0.44	0.32	-1.07	-1.48	-0.18	1.18	-0.37	0.63	0.69	0.21
NO3	-	-	-	-	-	-	-	-	-	-	-	-	-
Pb	0.05	-0.66	-0.86	-0.65	-1.22	-0.99	-0.76	-0.31	0.36	-0.35	0.08	0.47	0.19
PO4	-	-	-	-	-	-	-	-	-	-	-	-	-
Sb	-	-	-	-	-	-	-	-	-	-	-	-	-
Se	-0.07	-0.08	-0.08	-0.04	-1.43	-0.08	-0.08	0.32	0.80	-2.03	-1.49	-1.36	0.28
Sn	-	-	-	-	-	-	-	-	-	-	-	-	-
SO4	0.05	0.06	0.07	0.05	0.72	0.06	0.08	0.11	0.21	0.09	-0.36	0.46	0.08
Sr	0.05	0.13	0.19	0.26	0.30	0.17	0.11	0.11	0.38	0.41	-0.14	-0.71	0.09
Th	-	-	-	-	-	-	-	-	-	-	-	-	-
U	-	-	-	-	-	-	-	-	-	-	-	-	-
V	0.04	-0.76	-1.09	-1.41	0.05	0.87	0.60	0.46	0.74	-0.50	-0.58	-0.56	0.21
Zn	0.05	0.10	0.14	0.19	0.26	0.49	0.33	0.04	0.33	0.22	0.72	0.91	0.12
Avg Deviati	0.02	0.07	0.09	0.14	0.19	0.16	0.17	0.13	0.14	0.15	0.13	0.17	0.17

Yellow = own pH All residuals within + 1 or - 1 are considered to represent a good fit.