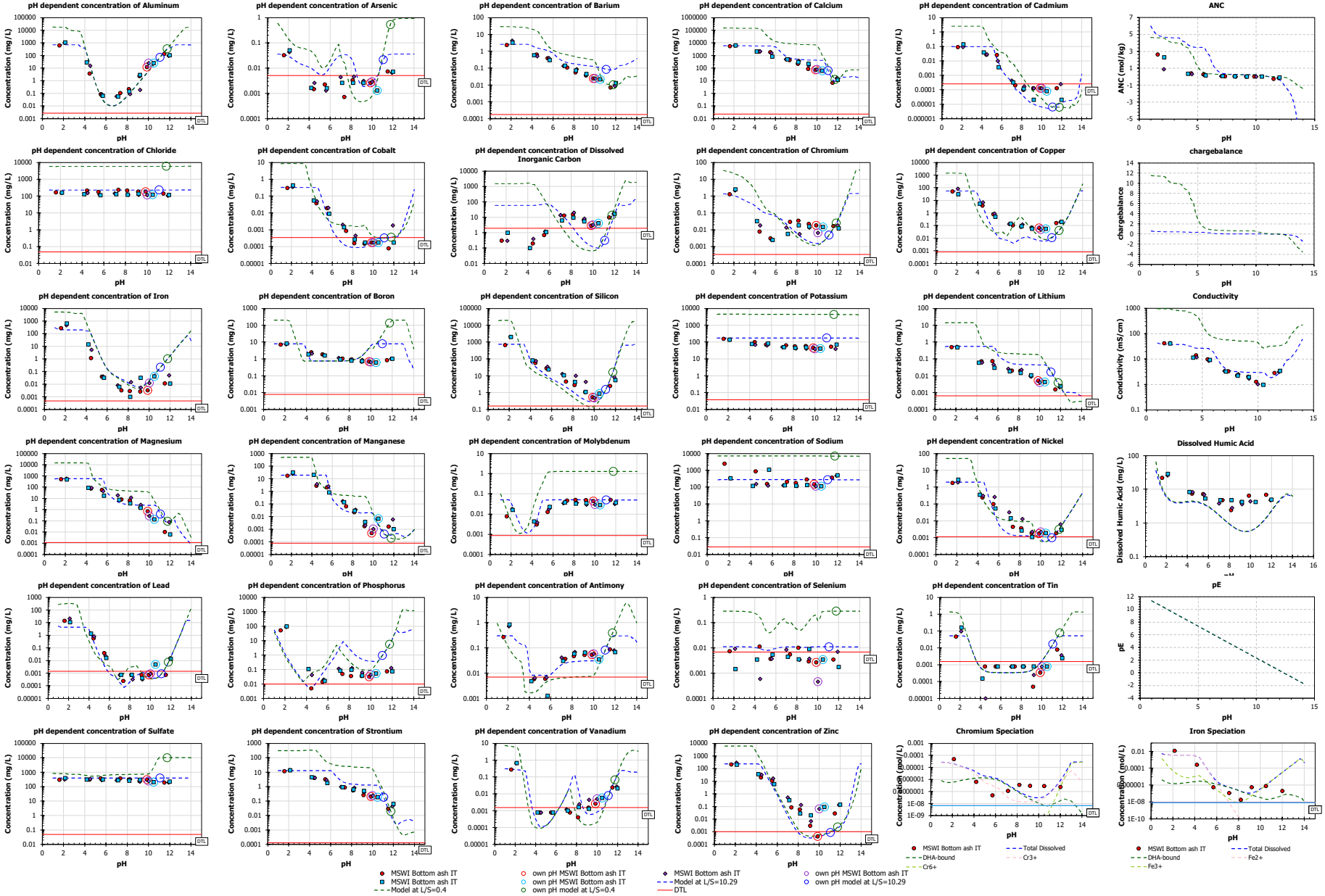
MSWI BOTTOM ASH IT

COMPARISON pH DEPENDENCE WITH MODEL



Object pH Dependent Leaching Test Model
Name MSWI Bottom ash IT

pH Dependent Leaching Test Scenario

Lab Test

Extra L/S Simulation

Lab Test

Model Parameters

Entity	Unit	Default
c0		-2.692
c1		-2.955
c2		1.067
c3		-0.1739
c4		0.01256
c5		-0.0003270
Clay	mg/kg	3000
Hydrous Ferric Oxide	mg/kg	150.0
L/S	L/kg	10.29
pE		2.500
pH		9.850
Solid Humic Acid	mg/kg	800.0
Simulated Low L/S	L/kg	0.4000

Available Content

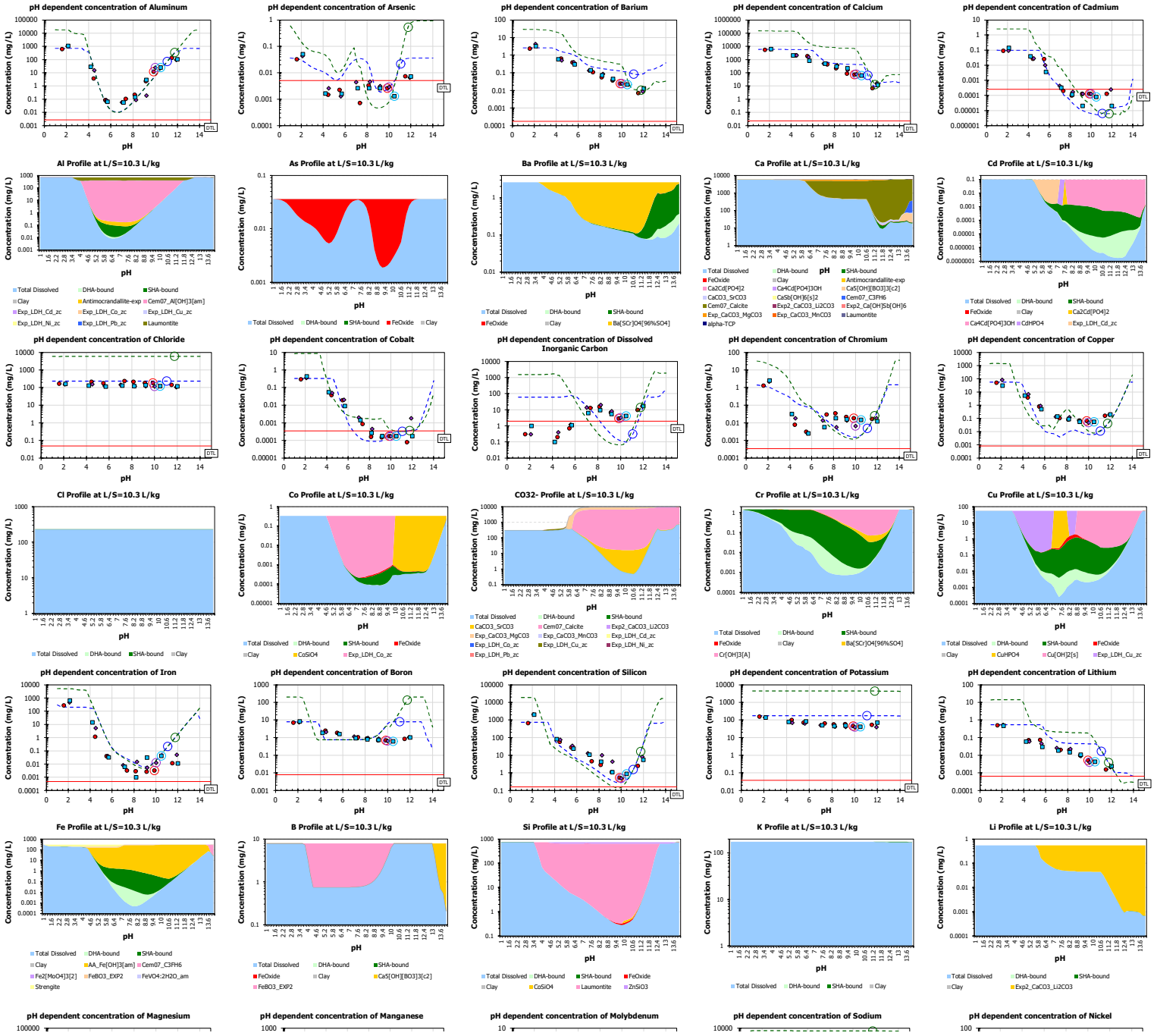
Entity	mg/kg	Entity	mg/kg	Entity	mg/kg
Acetic acid	2.220E-08	B	80.95	Sb	3.081
Ag	1.079E-08	Si	7680	Se	0.1138
Al	7223	Hg	2.006E-08	Sn	0.5403
As	0.3717	K	1795	SO4	4043
Ba	26.93	Li	5.613	Sr	131.8
Ca	6.179E+04	Mg	5709	V	3.202
Cd	1.027	Mn	194.1	Zn	2448
Cl	2386	Mo	0.5188		
Co	3.417	Na	2858		
CO32-	9.471E+04	Ni	20.33		
Cr	14.86	Pb	156.4		
Cu	572.5	PO4	1795		
Fe	3066				

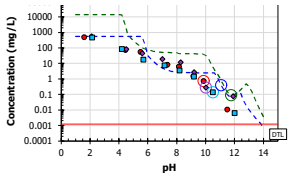
Solid Solutions

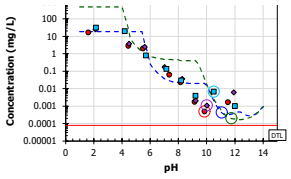
Name	End Member	Log(K)	Reaction
CSHii_ss	Cem07_Jenn_ss	-7.799	Cem07_Jenn_ss + 1.33333 H+ -> 1 CSHii_ss + 1.66667 Ca+2 + 1.76667 H2O + 1 H2SiO4-2
	Cem07_Tob_II_ss	10.36	Cem07_Tob_II_ss -> 1 CSHii_ss + 0.83333 Ca+2 + 0.33333 H+ + 0.16667 H2O + 1 H2SiO4-2

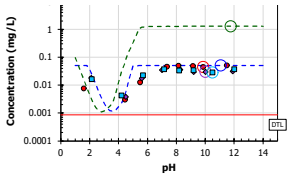
Minerals

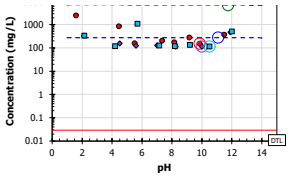
Name	Log(K)	Reaction
AA_Fe[OH]3[am]	16.60	AA_Fe[OH]3[am] + 1 H2O -> 1 Fe[OH]4- + 1 H+
alpha-TCP	25.50	alpha-TCP -> 3 Ca+2 + 2 PO4-3
Antimocrandallite-exp	63.00	Antimocrandallite-exp + 8 H2O -> 3 Al[OH]4- + 1 Ca+2 + 3 H+ + 2 Sb[OH]6-
Ba[SCr]O4[96%SO4]	9.790	Ba[SCr]O4[96%SO4] -> 1 Ba+2 + 0.04 CrO4-2 + 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
Ca4Cd[PO4]3OH	39.23	Ca4Cd[PO4]3OH + 1 H+ -> 4 Ca+2 + 1 Cd+2 + 1 H2O + 3 PO4-3
Ca5[OH][BO3]3[c2]	-53.00	Ca5[OH][BO3]3[c2] + 7 H+ -> 5 Ca+2 + 3 H2BO3- + 1 H2O
CaCO3_SrCO3	19.85	CaCO3_SrCO3 -> 2 CO3-2 + 1 Ca+2 + 1 Sr+2
CaSb[OH]6[s]2	19.41	CaSb[OH]6[s]2 -> 1 Ca+2 + 2 Sb[OH]6-
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_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
CoSiO4	6.289	CoSiO4 + 2 H+ -> 2 Co+2 + 1 H2SiO4-2
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
CuHPO4	26.00	CuHPO4 -> 1 Cu+2 + 1 H+ + 1 PO4-3
Exp_CaCO3_MgCO3	19.00	Exp_CaCO3_MgCO3 -> 2 CO3-2 + 1 Ca+2 + 1 Mg+2
Exp_CaCO3_MnCO3	21.48	Exp_CaCO3_MnCO3 -> 2 CO3-2 + 1 Ca+2 + 1 Mn+2
Exp_LDH_Cd_zc	60.06	Exp_LDH_Cd_zc + 1 H2O -> 1 Al[OH]4- + 3 CO3-2 + 3 Cd+2 + 1 H+
Exp_LDH_Co_zc	60.01	Exp_LDH_Co_zc + 1 H2O -> 1 Al[OH]4- + 3 CO3-2 + 3 Co+2 + 1 H+
Exp_LDH_Cu_zc	58.21	Exp_LDH_Cu_zc + 1 H2O -> 1 Al[OH]4- + 3 CO3-2 + 3 Cu+2 + 1 H+
Exp_LDH_Ni_zc	57.91	Exp_LDH_Ni_zc + 1 H2O -> 1 Al[OH]4- + 3 CO3-2 + 1 H+ + 3 Ni+2
Exp_LDH_Pb_zc	63.00	Exp_LDH_Pb_zc + 1 H2O -> 1 Al[OH]4- + 3 CO3-2 + 1 H+ + 3 Pb+2
Exp2_Ca[OH]Sb[OH]6	1.000	Exp2_Ca[OH]Sb[OH]6 + 1 H+ -> 1 Ca+2 + 1 H2O + 1 Sb[OH]6-
Exp2_Ca2[OH]2[SeO4]	-8.000	Exp2_Ca2[OH]2[SeO4] + 2 H+ -> 2 Ca+2 + 2 H2O + 1 SeO4-2
Exp2_CaCO3_Li2CO3	25.14	Exp2_CaCO3_Li2CO3 -> 2 CO3-2 + 1 Ca+2 + 2 Li+
Fe2[MoO4]3[2]	86.35	Fe2[MoO4]3[2] + 8 H2O -> 2 Fe[OH]4- + 8 H+ + 3 MoO4-2
FeBO3_EXP2	30.00	FeBO3_EXP2 + 2 H2O -> 1 Fe[OH]4- + 2 H+ + 1 H2BO3-
FeVO4:2H2O_am	23.48	FeVO4:2H2O_am + 2 H2O -> 1 Fe[OH]4- + 1 VO2+
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
Pb[OH]2[C]	-8.150	Pb[OH]2[C] + 2 H+ -> 2 H2O + 1 Pb+2
PbHPO4	28.00	PbHPO4 -> 1 H+ + 1 PO4-3 + 1 Pb+2
Sn[OH]2[s]	1.447	Sn[OH]2[s] + 2 H+ -> 2 H2O + 1 Sn+2
Strengite	48.00	Strengite + 2 H2O -> 1 Fe[OH]4- + 4 H+ + 1 PO4-3
ZnHPO4	24.48	ZnHPO4 -> 1 H+ + 1 PO4-3 + 1 Zn+2
ZnSiO3	18.69	ZnSiO3 + 1 H2O -> 1 H2SiO4-2 + 1 Zn+2

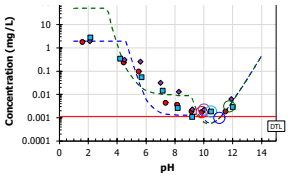

pH dependent concentration of Aluminum
pH dependent concentration of Arsenic
pH dependent concentration of Barium
pH dependent concentration of Calcium
pH dependent concentration of Cadmium
Al Profile at L/S=10.3 L/kg
As Profile at L/S=10.3 L/kg
Ba Profile at L/S=10.3 L/kg
Ca Profile at L/S=10.3 L/kg
Cd Profile at L/S=10.3 L/kg
pH dependent concentration of Chloride
pH dependent concentration of Cobalt
pH dependent concentration of Dissolved Inorganic Carbon
pH dependent concentration of Chromium
pH dependent concentration of Copper
Cl Profile at L/S=10.3 L/kg
Co Profile at L/S=10.3 L/kg
CO32- Profile at L/S=10.3 L/kg
Cr Profile at L/S=10.3 L/kg
Cu Profile at L/S=10.3 L/kg
pH dependent concentration of Iron
pH dependent concentration of Boron
pH dependent concentration of Silicon
pH dependent concentration of Potassium
pH dependent concentration of Lithium
Fe Profile at L/S=10.3 L/kg
B Profile at L/S=10.3 L/kg
Si Profile at L/S=10.3 L/kg
K Profile at L/S=10.3 L/kg
Li Profile at L/S=10.3 L/kg
pH dependent concentration of Magnesium
pH dependent concentration of Manganese
pH dependent concentration of Molybdenum
pH dependent concentration of Sodium
pH dependent concentration of Nickel
Concentration (mg/L)
pH
DTL
Total Dissolved
DHA-bound
SHA-bound
FeOxide
Clay
CoSiO4
Exp_LDH_Co_zc
Exp_LDH_Cu_zc
Exp_LDH_Cd_zc
Exp_LDH_Ni_zc
Exp_LDH_Pb_zc
Laumontite
Antimocrandallite-exp
Cem07_Al[OH]3[am]
Ba[SCr]O4[96%SO4]
CaCO3_SrCO3
Cem07_Calcite
Exp2_CaCO3_Li2CO3
Exp_CaCO3_MgCO3
Exp_CaCO3_MnCO3
Cem07_C3FH6
Exp2_Ca[OH]Sb[OH]6
alpha-TCP
Ca5[OH][BO3]3[c2]
Ca5Sb[OH]6[s]2
Ca2Cd[PO4]2
Ca4Cd[PO4]3OH
CdHPO4
Cr[OH]3[A]
Cu[OH]2[s]
CuHPO4
Fe2[MoO4]3[2]
FeBO3_EXP2
FeVO4:2H2O_am
Strengite
AA_Fe[OH]3[am]
Ca5[OH][BO3]3[c2]
ZnSiO3



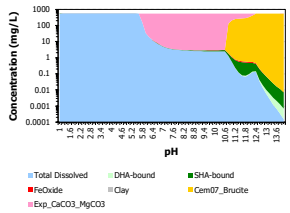




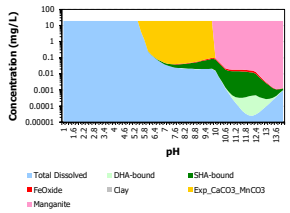




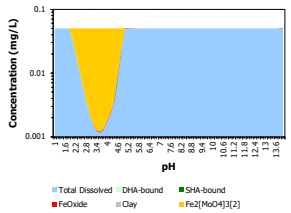
Mg Profile at L/S=10.3 L/kg



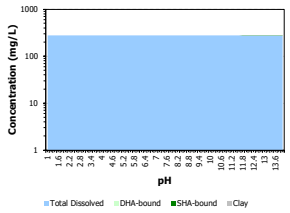
Mn Profile at L/S=10.3 L/kg



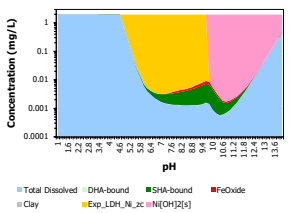
Mo Profile at L/S=10.3 L/kg



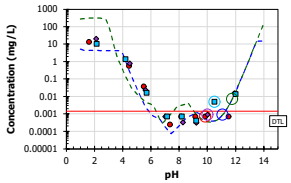
Na Profile at L/S=10.3 L/kg



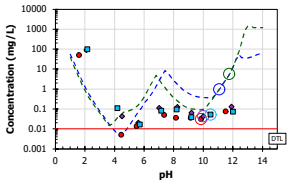
Ni Profile at L/S=10.3 L/kg



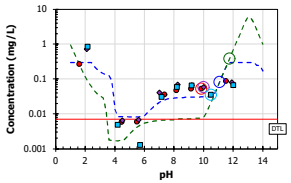
pH dependent concentration of Lead



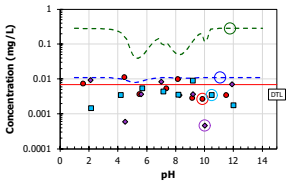
pH dependent concentration of Phosphorus



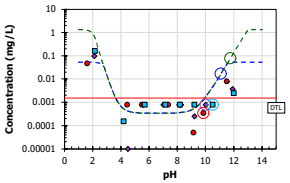
pH dependent concentration of Antimony



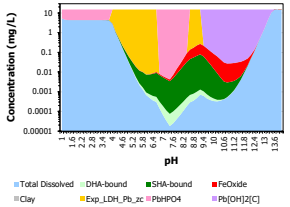
pH dependent concentration of Selenium



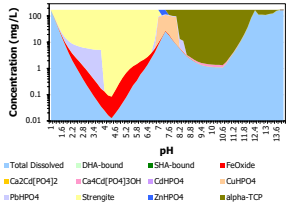
pH dependent concentration of Tin



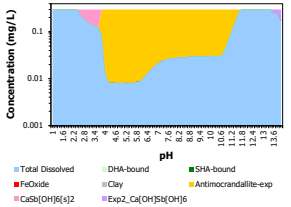
Pb Profile at L/S=10.3 L/kg



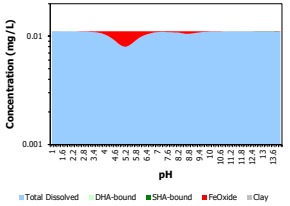
PO4 Profile at L/S=10.3 L/kg



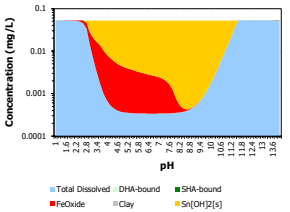
Sb Profile at L/S=10.3 L/kg



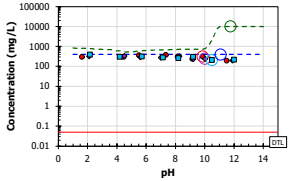
Se Profile at L/S=10.3 L/kg



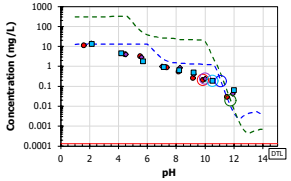
Sn Profile at L/S=10.3 L/kg



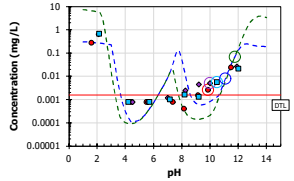
pH dependent concentration of Sulfate



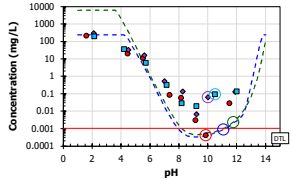
pH dependent concentration of Strontium



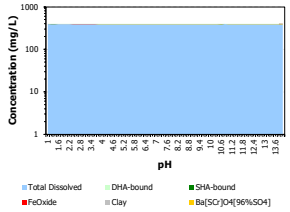
pH dependent concentration of Vanadium



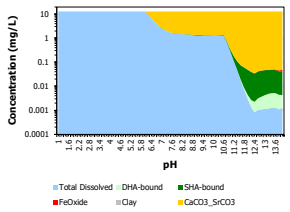
pH dependent concentration of Zinc



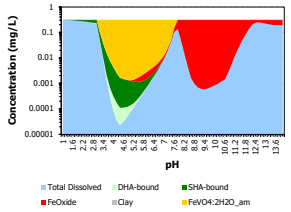
SO4 Profile at L/S=10.3 L/kg



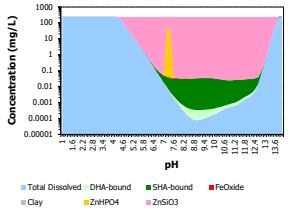
Sr Profile at L/S=10.3 L/kg



V Profile at L/S=10.3 L/kg



Zn Profile at L/S=10.3 L/kg



Model Comparison: residuals - Concentration

Name **MSWI Bottom ash IT**

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	*8*	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*Total Avg*
pH	*1.60*	*4.45*	*5.50*	*7.35*	*8.15*	*9.15*	*9.85*	*11.5*	*Deviation*
Al	0.05	0.80	-0.19	-0.73	-0.38	-0.43	-0.45	0.15	0.17
As	0.03	0.76	0.43	1.68	0.75	-0.12	-0.02	0.65	0.27
Ba	0.05	0.41	0.47	0.31	0.50	0.60	0.71	1.05	0.20
Ca	0.05	0.45	0.51	0.19	0.36	0.71	0.78	0.28	0.17
Cd	0.05	0.57	-0.23	-0.23	-0.44	-1.09	-1.27	-1.17	0.27
Cl	0.14	0.04	0.11	-0.01	0.03	0.11	0.10	0.22	0.04
Co	0.05	0.95	-0.48	-0.87	-0.25	-0.18	0.21	0.63	0.19
CO32-	-	-	-	-	-	-	-	-	-
Cr	-0.02	1.31	1.42	-0.32	-0.82	-1.03	-1.07	-0.13	0.32
Cu	0.05	-0.04	-1.29	-1.39	-0.91	-0.84	-0.99	-0.83	0.33
F	-	-	-	-	-	-	-	-	-
Fe	-0.11	1.91	1.37	0.90	0.58	0.40	0.66	1.70	0.40
B	0.05	-0.52	-0.40	-0.13	-0.04	0.35	0.83	0.97	0.19
Si	0.05	-0.22	-0.42	-0.32	-0.48	-0.47	-0.27	0.40	0.13
K	0.05	0.25	0.39	0.43	0.49	0.47	0.59	0.52	0.15
Li	0.05	0.88	0.87	0.43	0.39	0.66	0.93	0.61	0.24
Mg	0.05	0.88	1.00	-0.34	-0.35	0.23	0.54	0.97	0.23
Mn	0.05	0.83	0.64	-0.36	-0.02	1.06	1.59	-0.70	0.29
Mo	0.82	0.18	0.60	0.04	0.01	0.02	0.06	0.00	0.13
Na	-0.95	-0.49	0.25	0.13	0.20	0.00	0.26	-0.12	0.15
Ni	0.05	0.92	-0.46	-0.48	-0.44	-0.14	-0.13	0.01	0.15
Pb	-0.50	-0.23	-1.00	-0.46	-0.40	0.23	-0.14	0.62	0.18
PO4	-	-	-	-	-	-	-	-	-
Sb	0.05	0.16	0.14	-0.16	-0.22	-0.24	-0.24	0.40	0.08
Se	0.18	-0.08	0.36	0.31	0.03	0.57	0.62	0.50	0.14
Sn	0.05	-0.25	-0.35	-0.36	-0.34	1.03	0.59	0.74	0.19
SO4	0.12	0.11	0.03	0.03	0.10	0.21	0.11	0.31	0.05
Sr	0.05	0.51	0.60	0.33	0.43	0.70	0.79	-0.02	0.18
V	0.02	-0.85	-0.46	1.62	1.68	-0.39	-0.55	0.14	0.33
Zn	0.05	0.92	-0.39	-1.20	-1.94	-0.96	-0.03	-1.31	0.37
Avg Deviati	0.05	0.14	0.13	0.13	0.12	0.11	0.13	0.14	0.21

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