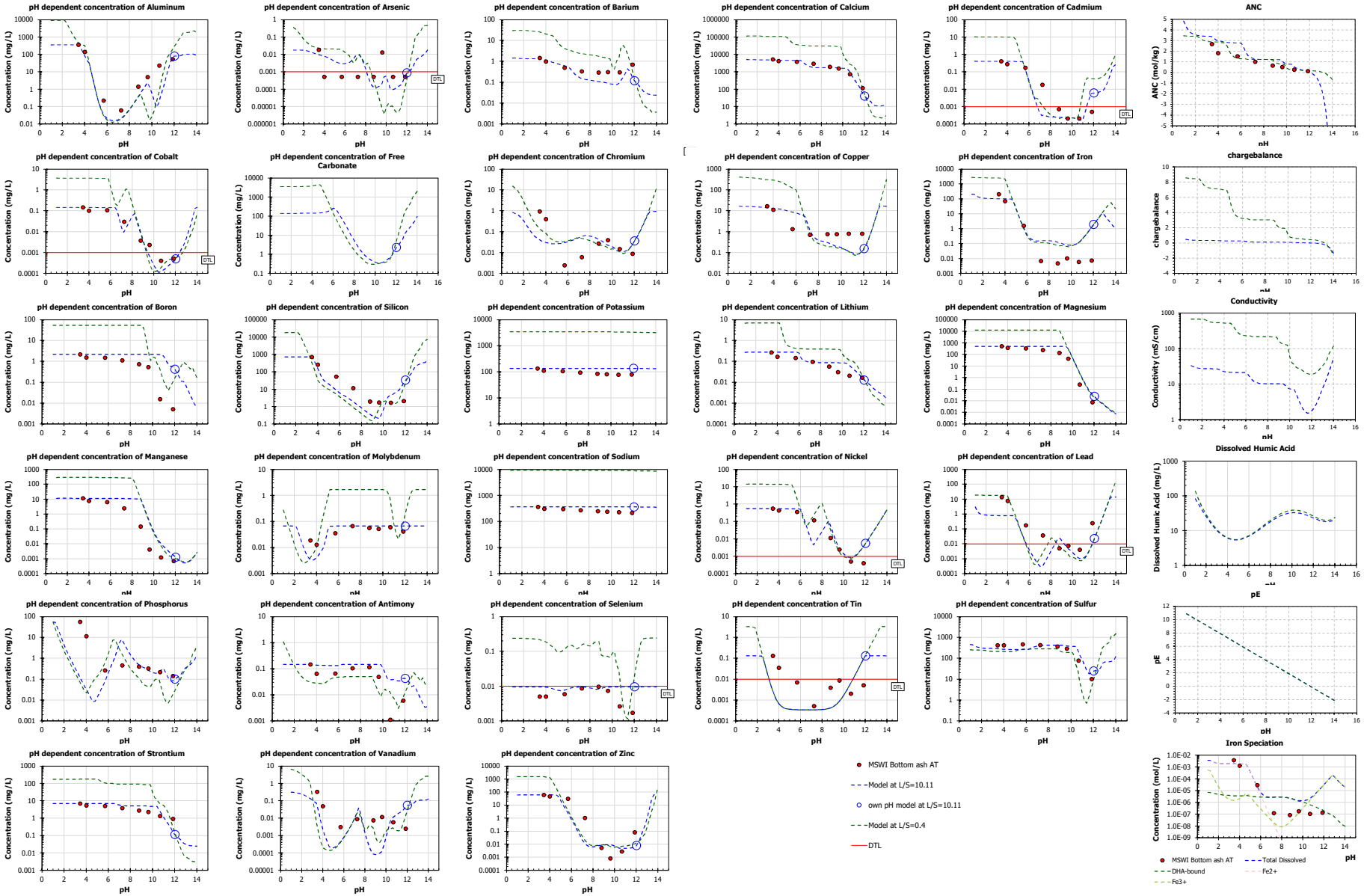
MSWI BOTTOM ASH AT

COMPARISON pH DEPENDENCE WITH MODEL



Object pH Dependent Leaching Test Model
Name MSWI Bottom ash AT

pH Dependent Leaching Test Scenario

Lab Test

Extra L/S Simulation

Lab Test

Model Parameters

Entity	Unit	Default
c0		-3.907
c1		-0.3991
c2		-0.1198
c3		0.04438
c4		-0.004148
c5		0.0001220
Clay	mg/kg	3000
Hydrous Ferric Oxide	mg/kg	150.0
L/S	L/kg	10.11
pE		1.470
pH		10.43
Solid Humic Acid	mg/kg	2000
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	21.80	Se	0.09660
Al	3614	Si	7279	Sn	1.323
As	0.1837	K	1373	SO4	1.392E+04
Ba	14.63	Li	2.760	Sr	70.71
Ca	5.178E+04	Mg	5026	V	3.257
Cd	4.110	Mn	113.8	Zn	608.8
Cl	3.545E-09	Mo	0.6727		
Co	1.476	Na	3669		
CO32-	4.500E+04	Ni	5.628		
Cr	9.543	Pb	140.8		
Cu	167.4	PO4	1754		
F	1.900E-09	Sb	1.472		
Fe	2079				

Solid Solutions

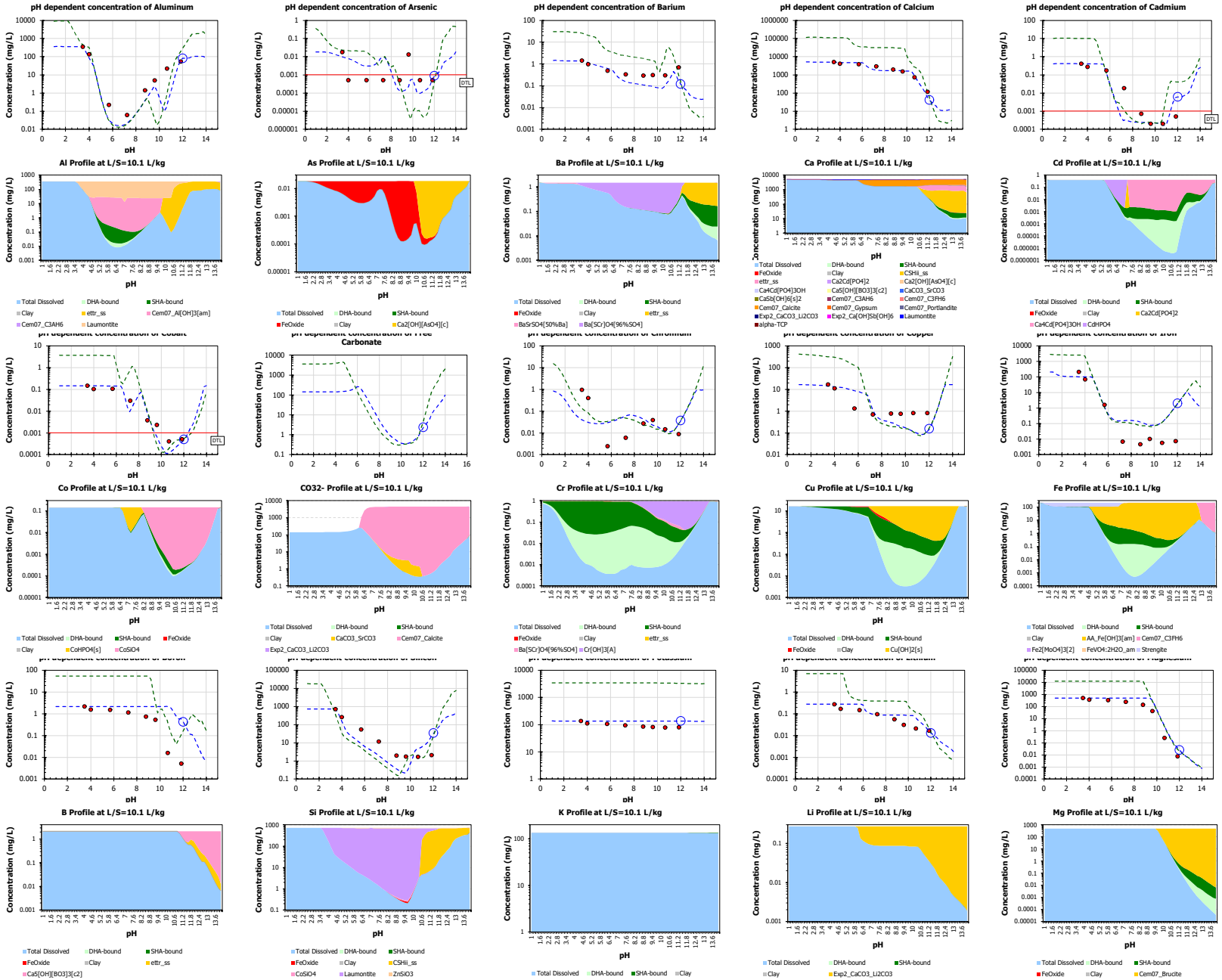
Name	End Member	Log(K)	Reaction
CSHii_ss	Cem07_Jenn_ss	-7.799	Cem07_Jenn_ss + 1.33333 H+ -> 1 CSHii_ss + 1.66667 Ca+2 + 1.76667 H2O + 1 H2SiO4-2
	Cem07_Tob_II_ss	10.36	Cem07_Tob_II_ss -> 1 CSHii_ss + 0.83333 Ca+2 + 0.33333 H+ + 0.16667 H2O + 1 H2SiO4-2
ettr_ss	AsO4_Ettringite_ss	26.79	AsO4_Ettringite_ss + 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
	Sb[OH]6-_Ettringite	-33.80	Sb[OH]6-_Ettringite_ss + 7 H+ + 17 H2O -> 2 Al[OH]4- + 6 Ca+2 + 3 Sb[OH]6- + 1 ettr_ss
	SeO4-2_Ettringite_s	4.408	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

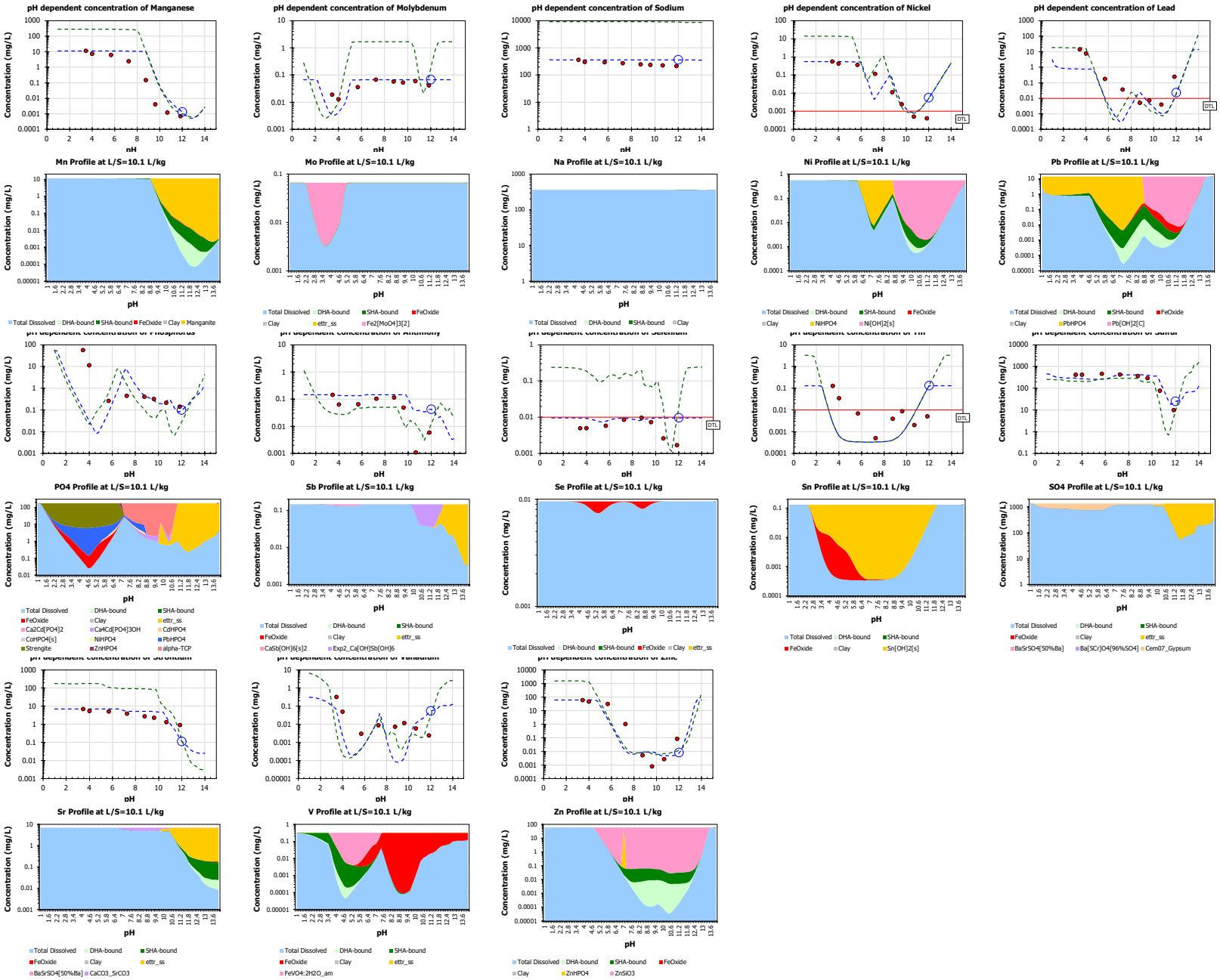
Minerals

Name	Log(K)	Reaction
AA_Fe[OH]3[am]	16.60	AA_Fe[OH]3[am] + 1 H2O -> 1 Fe[OH]4- + 1 H+
alpha-TCP	25.50	alpha-TCP -> 3 Ca+2 + 2 PO4-3
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
Ca2[OH][AsO4][c]	4.000	Ca2[OH][AsO4][c] + 1 H+ -> 1 AsO4-3 + 2 Ca+2 + 1 H2O
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-
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
Cem07_Portlandite	-22.79	Cem07_Portlandite + 2 H+ -> 1 Ca+2 + 2 H2O
CoHPO4[s]	24.48	CoHPO4[s] -> 1 Co+2 + 1 H+ + 1 PO4-3

Name	Log(K)	Reaction
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]	-8.843	Cu[OH]2[s] + 2 H+ -> 1 Cu+2 + 2 H2O
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_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
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
Li2_CaO_Al2O3_SiO2_8H2O[s]	22.69	Li2_CaO_Al2O3_SiO2_8H2O[s] -> 2 Al[OH]4- + 1 Ca+2 + 3 H2O + 1 H2SiO4-2 + 2 Li+
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+
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

MSWI BOTTOM ASH AT **COMPARISON AND PARTITIONING**




pH dependent concentration of Manganese
pH dependent concentration of Molybdenum
pH dependent concentration of Sodium
pH dependent concentration of Nickel
pH dependent concentration of Lead
Concentration (mg/L)
pH
Mn Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay Manganite
Mo Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay ettr_ss Fe2[MoO4]3[2]
Na Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound Clay
Ni Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay NiHPO4 Ni[OH]2[s]
Pb Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay PbHPO4 Pb[OH]2[C]
PO4 Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay ettr_ss Ca2Cd[PO4]2 Ca4Cd[PO4]3OH CdHPO4 CoHPO4[s] NiHPO4 PbHPO4 Strengite ZnHPO4 alpha-TCP
Sb Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay ettr_ss CaSb[OH]6[s]2 Exp2_Ca[OH]Sb[OH]6
Se Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay ettr_ss
Sn Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay Sn[OH]2[s]
SO4 Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay ettr_ss BaSrSO4[50%Ba] Ba[SCr]O4[96%SO4] Cem07_Gypsum
Sr Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay ettr_ss BaSrSO4[50%Ba] CaCO3_SrCO3
V Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay ettr_ss FeVO4:2H2O_am
Zn Profile at L/S=10.1 L/kg
Total Dissolved DHA-bound SHA-bound FeOxide Clay ZnHPO4 ZnSiO3

Model Comparison: residuals - Concentration

Name **MSWI Bottom ash AT**

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	*3.46*	*4.01*	*5.70*	*7.26*	*8.79*	*9.62*	*10.7*	*11.9*	*Deviation*
Al	-0.03	-0.21	-0.80	-0.43	-0.56	-0.33	-1.97	0.10	0.28
As	-0.27	1.20	0.78	1.27	-0.58	-1.74	-0.71	0.09	0.35
Ba	-0.02	0.07	0.11	-0.34	-0.42	-0.52	-0.46	-0.63	0.14
Br	-	-	-	-	-	-	-	-	-
Ca	-0.01	0.06	0.09	-0.20	-0.04	0.05	0.10	-0.30	0.05
Cd	0.00	0.17	-0.17	-1.76	-0.46	0.02	-0.05	1.06	0.26
Cl	-	-	-	-	-	-	-	-	-
Co	0.00	0.16	0.13	-0.44	0.31	-0.56	-0.51	-0.11	0.12
CO32-	-	-	-	-	-	-	-	-	-
Cr	-1.36	-1.11	1.10	1.00	0.21	-0.23	-0.08	0.48	0.30
Cu	-0.06	0.07	0.82	0.22	-0.40	-0.59	-0.84	-0.84	0.20
F	-	-	-	-	-	-	-	-	-
Fe	-0.29	0.17	-0.16	1.36	1.43	0.90	1.34	2.26	0.43
B	0.01	0.15	0.16	0.29	0.47	0.62	2.14	2.03	0.38
Si	-0.03	-0.23	-0.78	-0.78	-0.73	-0.89	0.46	1.06	0.25
Hg	-	-	-	-	-	-	-	-	-
K	0.01	0.09	0.11	0.17	0.21	0.23	0.24	0.23	0.06
Li	0.01	0.22	0.27	-0.02	0.20	0.46	0.49	-0.03	0.10
Mg	0.01	0.15	0.19	0.32	0.57	0.85	0.98	0.68	0.20
Mn	0.01	0.18	0.26	0.66	1.85	1.83	0.92	0.37	0.36
Mo	-0.74	-0.48	0.27	0.00	0.07	0.11	0.05	0.21	0.12
Na	0.01	0.08	0.09	0.13	0.17	0.19	0.21	0.23	0.06
Ni	0.00	0.11	0.18	-1.35	0.69	0.05	0.24	0.99	0.23
NO3	-	-	-	-	-	-	-	-	-
Pb	-1.25	-1.00	-1.24	-2.01	0.69	-0.19	-0.56	-1.33	0.41
PO4	-	-	-	-	-	-	-	-	-
Sb	0.00	0.34	0.32	0.15	0.10	0.48	1.54	0.85	0.24
Se	0.28	0.27	0.13	0.05	-0.06	0.11	0.57	0.75	0.13
Sn	-1.71	-1.72	-1.31	-0.17	-0.97	-0.97	0.54	1.29	0.42
SO4	-	-	-	-	-	-	-	-	-
Sr	0.00	0.12	0.14	0.14	0.27	0.35	0.27	-0.76	0.12
Th	-	-	-	-	-	-	-	-	-
U	-	-	-	-	-	-	-	-	-
V	-0.77	-1.36	-0.81	0.42	-1.92	-1.92	0.30	1.28	0.44
Zn	0.00	0.12	-1.15	-1.94	0.21	1.06	0.25	-1.13	0.34
Avg Deviati	0.11	0.12	0.12	0.18	0.15	0.16	0.17	0.19	0.24

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