

Analyse du surnageant par Visual Minteq v.2.14 (selon L. Bernier)

Visual MINTEQ - Output
File Options

No. of iterations: 5

pH 8.180
Ionic strength 0.0388

Sum of cations (molc/kg) 1.7315E-02
Sum of anions (molc/kg) 2.1685E-02
Charge difference (%) 11.205984

Equilibrium pe 7.235
Eh (mV) 428.0000177

Concentrations and activities of aqueous inorganic species (mol / l)

	Concentration	Activity	Log activity
Al(OH) ₂ ⁺	9.4953E-10	7.9323E-10	-9.101
Al(OH) ₃ (aq)	2.3895E-08	2.4109E-08	-7.618
Al(OH) ₄ ⁻	5.5344E-06	4.6234E-06	-5.335
Al(SO ₄) ₂ ⁻	5.3109E-15	4.4367E-15	-14.353
Al ³⁺	2.1718E-15	4.3036E-16	-15.366
Al ₂ (OH) ₂ ⁺	1.5240E-21	8.5749E-23	-22.067
Al ₂ (OH) ₂ CO ₃ ⁺	2.6495E-16	1.2904E-16	-15.889
Al ₃ (OH) ₄ ⁺	4.8459E-26	5.4029E-28	-27.267
AlOH ⁺	1.3460E-12	6.5556E-13	-12.183
AlSO ₄ ⁺	1.8559E-14	1.5504E-14	-13.810
Ca ²⁺	7.9023E-03	3.8487E-03	-2.415
CaCO ₃ (aq)	9.4389E-06	9.5236E-06	-5.021
CaHCO ₃ ⁺	1.2328E-05	1.0299E-05	-4.987
CaOH ⁺	1.4002E-07	1.1698E-07	-6.932
CaSO ₄ (aq)	4.5504E-03	4.5912E-03	-2.338
Cd(CO ₃) ₂ ²⁻	1.3527E-12	6.5884E-13	-12.181
Cd(OH) ₂ (aq)	2.0582E-12	2.0767E-12	-11.683

Gases

View species distribution Display saturation indices Equilibrated mass distribution

Execution time (s): .4882813

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ANALYSE DU SURNAGEANT DES BOUES PAR VISUAL MINTEQ

Tableau des espèces (essais réalisés par le Dr Bernier)

	<u>Concentration</u>	<u>Activity</u>	<u>Log activity</u>
Al(OH) ₂ ⁺	9,4953E-10	7,9323E-10	-9,101
Al(OH) ₃ (aq)	2,3895E-08	2,4109E-08	-7,618
Al(OH) ₄ ⁻	5,5344E-06	4,6234E-06	-5,335
Al(SO ₄) ₂ ⁻	5,3109E-15	4,4367E-15	-14,353
Al ⁺³	2,1718E-15	4,3036E-16	-15,366
Al ₂ (OH) ₂ ⁺⁴	1,524E-21	8,5749E-23	-22,067
Al ₂ (OH) ₂ CO ₃ ⁺²	2,6495E-16	1,2904E-16	-15,889
Al ₃ (OH) ₄ ⁺⁵	4,8459E-26	5,4029E-28	-27,267
AlOH ⁺²	1,346E-12	6,5556E-13	-12,183
AlSO ₄ ⁺	1,8559E-14	1,5504E-14	-13,81
Ca ⁺²	0,0079023	0,0038487	-2,415
CaCO ₃ (aq)	9,4389E-06	9,5236E-06	-5,021
CaHCO ₃ ⁺	0,000012328	0,000010299	-4,987
CaOH ⁺	1,4002E-07	1,1698E-07	-6,932
CaSO ₄ (aq)	0,0045504	0,0045912	-2,338
Cd(CO ₃) ₂ ⁻²	1,3527E-12	6,5884E-13	-12,181
Cd(OH) ₂ (aq)	2,0582E-12	2,0767E-12	-11,683
Cd(OH) ₃ ⁻	2,3134E-16	1,9326E-16	-15,714
Cd(OH) ₄ ⁻²	9,894E-23	4,8187E-23	-22,317
Cd(SO ₄) ₂ ⁻²	3,1439E-09	1,5312E-09	-8,815
Cd ⁺²	3,6664E-08	1,7857E-08	-7,748
Cd ₂ OH ⁺³	9,7583E-17	1,9337E-17	-16,714
CdCO ₃ (aq)	5,9076E-10	5,9606E-10	-9,225
CdHCO ₃ ⁺	1,0226E-11	8,5426E-12	-11,068
CdOH ⁺	2,5864E-10	2,1607E-10	-9,665
CdSO ₄ (aq)	2,1604E-08	2,1798E-08	-7,662
CO ₃ ⁻²	3,0614E-06	0,000001491	-5,827
Cu(CO ₃) ₂ ⁻²	5,8454E-09	2,8469E-09	-8,546
Cu(OH) ₂ (aq)	1,1724E-07	1,1829E-07	-6,927
Cu(OH) ₃ ⁻	4,4041E-10	3,6792E-10	-9,434
Cu(OH) ₄ ⁻²	9,1405E-15	4,4518E-15	-14,351
Cu ⁺¹	2,7567E-12	2,3029E-12	-11,638
Cu ⁺²	1,659E-07	8,0798E-08	-7,093
Cu ₂ (OH) ₂ ⁺²	7,8128E-09	3,8051E-09	-8,42
Cu ₂ OH ⁺³	7,9538E-12	1,5761E-12	-11,802
Cu ₃ (OH) ₄ ⁺²	9,2422E-10	4,5013E-10	-9,347

	<u>Concentration</u>	<u>Activity</u>	<u>Log activity</u>
CuCO3 (aq)	7,0309E-07	7,094E-07	-6,149
CuHCO3+	1,2823E-09	1,0712E-09	-8,97
CuHSO4+	7,2799E-16	6,0816E-16	-15,216
CuOH+	4,659E-07	3,8921E-07	-6,41
CuSO4 (aq)	9,553E-08	9,6387E-08	-7,016
Fe(OH)2 (aq)	4,5203E-18	4,5608E-18	-17,341
Fe(OH)2+	6,9226E-08	5,7831E-08	-7,238
Fe(OH)3-	2,6299E-18	2,197E-18	-17,658
Fe(OH)3 (aq)	9,377E-08	9,4611E-08	-7,024
Fe(OH)4-	1,6063E-08	1,3419E-08	-7,872
Fe(OH)4-2	6,8714E-27	3,3466E-27	-26,475
Fe(SO4)2-	7,7257E-19	6,454E-19	-18,19
Fe+2	1,2762E-13	6,2155E-14	-13,207
Fe+3	5,0071E-19	9,9219E-20	-19,003
Fe2(OH)2+4	5,6042E-24	3,1532E-25	-24,501
Fe3(OH)4+5	2,3641E-29	2,6358E-31	-30,579
FeHCO3+	1,9682E-16	1,6442E-16	-15,784
FeOH+	4,512E-15	3,7693E-15	-14,424
FeOH+2	2,0036E-13	9,7584E-14	-13,011
FeSO4 (aq)	7,8743E-14	7,945E-14	-13,1
FeSO4+	6,9394E-18	5,7971E-18	-17,237
H+1	7,9088E-09	6,6069E-09	-8,18
H2CO3* (aq)	3,0946E-06	3,1224E-06	-5,506
HCO3-	0,00025153	0,00021013	-3,678
HSO4-	4,0246E-09	3,3621E-09	-8,473
K+1	0,00012332	0,00010302	-3,987
KOH (aq)	1,1022E-26	1,1121E-26	-25,954
KSO4-	4,5463E-06	3,7979E-06	-5,42
Mg+2	0,00036633	0,00017841	-3,749
Mg2CO3+2	3,7912E-10	1,8465E-10	-9,734
MgCO3 (aq)	2,193E-07	2,2127E-07	-6,655
MgHCO3+	4,6028E-07	3,8452E-07	-6,415
MgOH+	1,2951E-07	1,082E-07	-6,966
MgSO4 (aq)	0,00016756	0,00016906	-3,772
Ni(OH)2 (aq)	7,357E-10	7,423E-10	-9,129
Ni(OH)3-	1,3535E-12	1,1307E-12	-11,947
Ni(SO4)2-2	1,1768E-10	5,7312E-11	-10,242
Ni+2	6,5683E-07	3,199E-07	-6,495
NiCO3 (aq)	1,7564E-08	1,7721E-08	-7,751
NiHCO3+	9,9222E-09	8,289E-09	-8,081
NiOH+	7,3435E-09	6,1347E-09	-8,212
NiSO4 (aq)	3,2942E-07	3,3238E-07	-6,478
OH-	1,8234E-06	1,5233E-06	-5,817
SO4-2	0,010692	0,0052073	-2,283
Zn(CO3)2-2	1,3543E-08	6,5958E-09	-8,181

	<u>Concentration</u>	<u>Activity</u>	<u>Log activity</u>
Zn(OH)2 (aq)	5,4197E-06	5,4684E-06	-5,262
Zn(OH)3-	4,9975E-08	4,1748E-08	-7,379
Zn(OH)4-2	5,1983E-12	2,5318E-12	-11,597
Zn(SO4)2-2	0,000015775	7,6829E-06	-5,114
Zn+2	0,0003053	0,00014869	-3,828
ZnCO3 (aq)	0,000012645	0,000012758	-4,894
ZnHCO3+	1,1827E-06	9,8805E-07	-6,005
ZnOH+	0,000027113	0,00002265	-4,645
ZnSO4 (aq)	0,00016789	0,0001694	-3,771

Tableau de distribution des espèces (essais réalisés par le Dr Bernier)

<u>Component</u>	<u>% of total component concentration</u>	<u>Species name</u>
Cu+2	10,542	Cu+2
	29,607	CuOH+
	7,45	Cu(OH)2 (aq)
	0,028	Cu(OH)3-
	0,993	Cu2(OH)2+2
	0,176	Cu3(OH)4+2
	6,071	CuSO4 (aq)
	44,679	CuCO3 (aq)
	0,081	CuHCO3+
	0,371	Cu(CO3)2-2
SO4-2	68,475	SO4-2
	1,075	ZnSO4 (aq)
	0,202	Zn(SO4)2-2
	1,073	MgSO4 (aq)
	29,142	CaSO4 (aq)
	0,029	KSO4-
CO3-2	1,039	CO3-2
	85,342	HCO3-
	1,05	H2CO3* (aq)
	4,29	ZnCO3 (aq)
	0,401	ZnHCO3+
	0,239	CuCO3 (aq)
	0,074	MgCO3 (aq)
	0,156	MgHCO3+
	4,183	CaHCO3+
	3,202	CaCO3 (aq)
Al+3	0,017	Al(OH)2+
	0,43	Al(OH)3 (aq)

<u>Component</u>	<u>% of total component concentration</u>	<u>Species name</u>
	99,553	Al(OH) ₄ ⁻
Ca ⁺²	63,347	Ca ⁺²
	36,477	CaSO ₄ (aq)
	0,099	CaHCO ₃ ⁺
	0,076	CaCO ₃ (aq)
Zn ⁺²	57,024	Zn ⁺²
	5,064	ZnOH ⁺
	1,012	Zn(OH) ₂ (aq)
	31,359	ZnSO ₄ (aq)
	2,946	Zn(SO ₄) ₂ ⁻²
	2,362	ZnCO ₃ (aq)
	0,221	ZnHCO ₃ ⁺
Fe ⁺²	60,46	Fe ⁺²
	2,138	FeOH ⁺
	37,305	FeSO ₄ (aq)
	0,093	FeHCO ₃ ⁺
K ⁺¹	96,445	K ⁺¹
	3,555	KSO ₄ ⁻
Mg ⁺²	68,511	Mg ⁺²
	0,024	MgOH ⁺
	31,337	MgSO ₄ (aq)
	0,041	MgCO ₃ (aq)
	0,086	MgHCO ₃ ⁺
Cd ⁺²	58,874	Cd ⁺²
	0,415	CdOH ⁺
	34,692	CdSO ₄ (aq)
	5,048	Cd(SO ₄) ₂ ⁻²
	0,949	CdCO ₃ (aq)
	0,016	CdHCO ₃ ⁺
Ni ⁺²	64,273	Ni ⁺²
	0,719	NiOH ⁺
	0,072	Ni(OH) ₂ (aq)
	32,235	NiSO ₄ (aq)
	0,012	Ni(SO ₄) ₂ ⁻²
	1,719	NiCO ₃ (aq)
	0,971	NiHCO ₃ ⁺
Cu ⁺¹	100	Cu ⁺¹
Fe ⁺³	38,661	Fe(OH) ₂ ⁺
	52,368	Fe(OH) ₃ (aq)
	8,971	Fe(OH) ₄ ⁻

Tableau de distribution massique (essais réalisés par le Dr Bernier)

<u>Component</u>	<u>Total dissolved</u>	<u>% dissolved</u>	<u>Total sorbed</u>	<u>% sorbed</u>	<u>Total precipitated</u>	<u>% precipitated</u>
Al+3	5,5593E-06	100	0	0	0	0
Ca+2	0,012475	100	0	0	0	0
Cd+2	6,2275E-08	100	0	0	0	0
CO3-2	0,00029474	100	0	0	0	0
Cu+1	2,7567E-12	100	0	0	0	0
Cu+2	1,5736E-06	100	0	0	0	0
E-1	0	0	0	0	0	0
Fe+2	2,1108E-13	100	0	0	0	0
Fe+3	1,7906E-07	100	0	0	0	0
H+1	0,0002081	100	0	0	0	0
K+1	0,00012787	100	0	0	0	0
Mg+2	0,00053469	100	0	0	0	0
Ni+2	1,0219E-06	100	0	0	0	0
SO4-2	0,015614	100	0	0	0	0
Zn+2	0,00053539	100	0	0	0	0

Tableau des indices de saturation minéralogique (essais réalisés par le Dr Bernier)

<u>Mineral</u>	<u>log IAP</u>	<u>Sat. Index</u>	<u>Stoich-iometry</u>									
Al(OH)3 (am)	9,173	-1,627	1	Al+3	3	H2O	-3	H+1				
Al(OH)3 (Soil)	9,173	0,883	1	Al+3	3	H2O	-3	H+1				
Al2O3	18,347	-1,305	2	Al+3	3	H2O	-6	H+1				
Al4(OH)10SO4	18,05	-4,65	-10	H+1	4	Al+3	1	SO4-2	10	H2O		
AlOHSO4	-9,47	-6,24	-1	H+1	1	Al+3	1	SO4-2	1	H2O		
Alunite	-54,654	-53,254	1	K+1	3	Al+3	2	SO4-2	6	H2O		
Anhydrite	-4,698	-0,338	1	Ca+2	1	SO4-2						
Antlerite	9,158	0,37	3	Cu+2	4	H2O	-4	H+1	1	SO4-2		
Aragonite	-8,241	0,099	1	Ca+2	1	CO3-2						
Artinite	3,035	-6,565	-2	H+1	2	Mg+2	1	CO3-2	5	H2O		
Azurite	-16,571	0,829	3	Cu+2	2	H2O	-2	H+1	2	CO3-2		
Bianchite	-6,112	-4,347	1	Zn+2	1	SO4-2	6	H2O				
Boehmite	9,173	0,595	-3	H+1	1	Al+3	2	H2O				
Brochantite	18,425	3,203	4	Cu+2	6	H2O	-6	H+1	1	SO4-2		
Brucite	12,611	-4,233	1	Mg+2	2	H2O	-2	H+1				
Bunsenite	9,865	-2,581	-2	H+1	1	Ni+2	1	H2O				
CaCO3xH2O	-8,241	-1,101	1	Ca+2	1	CO3-2	1	H2O				
Calcite	-8,241	0,239	1	Ca+2	1	CO3-2						

<u>Mineral</u>	<u>log IAP</u>	<u>Sat. Index</u>	<u>Stoich- iometry</u>										
Cd metal (alpha)	-22,218	-35,733	1	Cd+2	2	E-1							
Cd metal (gamma)	-22,218	-35,836	1	Cd+2	2	E-1							
Cd(OH)2	8,611	-5,033	1	Cd+2	2	H2O	-2	H+1					
Cd3(OH)4SO4	7,191	-15,369	-4	H+1	3	Cd+2	4	H2O	1	SO4-2			
Cd3OH2(SO4)2	-11,452	-18,162	-2	H+1	3	Cd+2	2	H2O	2	SO4-2			
Cd4(OH)6SO4	15,803	-12,597	-6	H+1	4	Cd+2	6	H2O	1	SO4-2			
CdSO4	-10,032	-9,859	1	Cd+2	1	SO4-2							
CdSO4:1H2O	-10,032	-8,306	1	Cd+2	1	SO4-2	1	H2O					
CdSO4:2,67H2O	-10,032	-8,159	1	Cd+2	1	SO4-2	2,67	H2O					
Chalcanthite	-9,377	-6,737	1	Cu+2	1	SO4-2	5	H2O					
Cu metal	-18,873	-10,117	1	Cu+1	1	E-1							
Cu(OH)2	9,267	0,593	1	Cu+2	2	H2O	-2	H+1					
Cu2SO4	-25,559	-23,609	2	Cu+1	1	SO4-2							
CuCO3	-12,919	-1,419	1	Cu+2	1	CO3-2							
CuOCuSO4	-0,109	-10,412	-2	H+1	2	Cu+2	1	H2O	1	SO4-2			
Cupric Ferrite	20,34	14,352	-8	H+1	1	Cu+2	2	Fe+3	4	H2O			
Cuprite	-6,916	-5,51	2	Cu+1	1	H2O	-2	H+1					
Cuprous Ferrite	2,078	10,996	-4	H+1	1	Cu+1	1	Fe+3	2	H2O			
CuSO4	-9,376	-12,315	1	Cu+2	1	SO4-2							
Diaspore	9,173	2,3	-3	H+1	1	Al+3	2	H2O					
Dolomite (disordered)	-17,816	-1,276	1	Ca+2	1	Mg+2	2	CO3-2					
Dolomite (ordered)	-17,816	-0,726	1	Ca+2	1	Mg+2	2	CO3-2					
Epsomite	-6,033	-3,907	1	Mg+2	1	SO4-2	7	H2O					
Fe(OH)2	3,153	-10,411	1	Fe+2	2	H2O	-2	H+1					
Fe2(SO4)3	-44,857	-41,123	2	Fe+3	3	SO4-2							
Fe3(OH)8	14,225	-5,997	-8	H+1	2	Fe+3	1	Fe+2	8	H2O			
Ferrihydrite	5,536	2,345	1	Fe+3	3	H2O	-3	H+1					
Gibbsite (C)	9,173	1,433	1	Al+3	3	H2O	-3	H+1					
Goethite	5,536	5,045	1	Fe+3	2	H2O	-3	H+1					
Goslarite	-6,113	-4,101	1	Zn+2	1	SO4-2	7	H2O					
Gypsum	-4,699	-0,089	1	Ca+2	1	SO4-2	2	H2O					
Hematite	11,073	12,491	2	Fe+3	3	H2O	-6	H+1					
Hercynite	21,5	-1,393	-8	H+1	1	Fe+2	2	Al+3	4	H2O			
H-Jarosite	-20,679	-8,579	-5	H+1	3	Fe+3	2	SO4-2	7	H2O			
Huntite	-36,966	-6,998	3	Mg+2	1	Ca+2	4	CO3-2					
Hydromagnesite	-25,69	-16,924	5	Mg+2	4	CO3-2	-2	H+1	6	H2O			
Hydrozincite	18,287	9,587	5	Zn+2	2	CO3-2	-6	H+1	6	H2O			
K-Alum	-23,923	-18,753	1	K+1	1	Al+3	2	SO4-2	12	H2O			
K-Jarosite	-16,485	-1,685	-6	H+1	1	K+1	3	Fe+3	2	SO4-2	6	H2O	
Langite	18,425	0,936	-6	H+1	4	Cu+2	7	H2O	1	SO4-2			
Lepidocrocite	5,536	4,165	-3	H+1	1	Fe+3	2	H2O					
Lime	13,945	-18,754	-2	H+1	1	Ca+2	1	H2O					
Maghemite	11,073	4,687	-6	H+1	2	Fe+3	3	H2O					

<u>Mineral</u>	<u>log IAP</u>	<u>Sat. Index</u>	<u>Stoich- iometry</u>									
Magnesioferrite	23,684	6,824	-8	H+1	1	Mg+2	2	Fe+3	4	H2O		
Magnesite	-9,575	-2,115	1	Mg+2	1	CO3-2						
Magnetite	14,226	10,823	-8	H+1	2	Fe+3	1	Fe+2	4	H2O		
Malachite	-3,652	1,817	2	Cu+2	2	H2O	-2	H+1	1	CO3-2		
Melanterite	-15,491	-13,282	1	Fe+2	1	SO4-2	7	H2O				
Mg(OH)2 (active)	12,611	-6,183	1	Mg+2	2	H2O	-2	H+1				
Morenosite	-8,78	-6,635	1	Ni+2	1	SO4-2	7	H2O				
Nesquehonite	-9,576	-4,906	1	Mg+2	1	CO3-2	3	H2O				
Ni(OH)2	9,865	-2,929	1	Ni+2	2	H2O	-2	H+1				
Ni4(OH)6SO4	20,815	-11,185	-6	H+1	4	Ni+2	1	SO4-2	6	H2O		
NiCO3	-12,321	-1,121	1	Ni+2	1	CO3-2						
Otavite	-13,575	-1,565	1	Cd+2	1	CO3-2						
Periclase	12,611	-8,973	-2	H+1	1	Mg+2	1	H2O				
Portlandite	13,945	-8,859	1	Ca+2	2	H2O	-2	H+1				
Retgersite	-8,78	-6,74	1	Ni+2	1	SO4-2	6	H2O				
Siderite	-19,033	-8,443	1	Fe+2	1	CO3-2						
Smithsonite	-9,654	1,246	1	Zn+2	1	CO3-2						
Spinel	30,958	-5,889	-8	H+1	1	Mg+2	2	Al+3	4	H2O		
Tenorite	9,267	1,623	1	Cu+2	1	H2O	-2	H+1				
Vaterite	-8,241	-0,331	1	Ca+2	1	CO3-2						
Wustite	3,853	-7,835	-2	H+1	0,947	Fe+2	1	H2O				
Zincite	12,532	1,198	1	Zn+2	1	H2O	-2	H+1				
Zincosite	-6,111	-10,041	1	Zn+2	1	SO4-2						
Zn metal	-18,298	-44,087	1	Zn+2	2	E-1						
Zn(OH)2 (am)	12,532	0,058	1	Zn+2	2	H2O	-2	H+1				
Zn(OH)2 (beta)	12,532	0,778	1	Zn+2	2	H2O	-2	H+1				
Zn(OH)2 (epsilon)	12,532	0,998	1	Zn+2	2	H2O	-2	H+1				
Zn(OH)2 (gamma)	12,532	0,798	1	Zn+2	2	H2O	-2	H+1				
Zn2(OH)2SO4	6,421	-1,079	-2	H+1	2	Zn+2	2	H2O	1	SO4-2		
Zn3O(SO4)2	0,31	-18,604	-2	H+1	3	Zn+2	2	SO4-2	1	H2O		
Zn4(OH)6SO4	31,484	3,084	-6	H+1	4	Zn+2	6	H2O	1	SO4-2		
ZnCO3	-9,654	1,146	1	Zn+2	1	CO3-2						
ZnCO3:1H2O	-9,654	0,606	1	Zn+2	1	CO3-2	1	H2O				
ZnO (active)	12,532	1,344	-2	H+1	1	Zn+2	1	H2O				
ZnSO4:1H2O	-6,111	-5,473	1	Zn+2	1	SO4-2	1	H2O				