

Annexe 1: Blank concentrations of cobalt without reactor and from the reactor

Blank without reactor		
Sample	[Co] nM	
1	0.055	
2	0.022	
3	0.126	
Avg/Stdev	0.068	0.053
Blank from the reactor		
Intermediate time (min)	[Co] nM	
5.5	0.055	
9.5	0.014	
11.5	0.074	
17.5	0.101	
27.5	0.093	
37.5	0.040	
52.5	0.045	
67.5	0.088	
Avg/Stdev	0.065	0.033

Annexe 2: Elemental composition of the coal dust and loess samples determined by ICP-AES (mg/g).

Elemental composition ($\mu\text{g/g}$)			
Loess		Coal dust	
Al	70460.6	Al	106362.8
Fe	69149.6	Fe	61983.5
Mg	26168.3	K	38659.5
K	25989.8	Mg	17515.6
Ca	24979.6	Ca	15512.5
Ti	18070.3	Ti	5303.6
Na	12485.1	S	3946.0
P	2946.4	Na	3681.6
Mn	1279.8	P	1329.5
Ba	565.9	Ba	1289.0
S	519.5	Mn	764.9
Zr	299.8	Zn	744.2
		Si	608.7
Sr	276.9	Sr	597.1
V	216.3	Ni	430.8
Cr	189.9	V	395.3
Co	181.8	Rb	250.6
Rb	137.7	Cr	222.4
Zn	102.4	Pb	217.1
Ni	67.7	Co	212.8
Pb	65.0	Cu	210.9
Cu	53.0	Zr	191.7
Sc	33.5	Li	153.5
Li	19.5	Sc	30.2
Cd	10.7	Ge	15.7
Ge	4.6	Be	13.6
Be	2.4	Cd	9.3

Annexe 3: Cobalt from coal dust with and without light irradiation. $[Co]_{out}$: Cobalt concentration measured at the exit of the reactor; $[Co]_{in}$: Cobalt concentration naturally present in the seawater used for the dissolution experiments. These concentrations are corrected from the blank concentrations. To obtain the dissolution rate in nmol/min instead of %/min, the dissolution in %/min has to be multiplied by the bulk concentration of the selected dust (*cf.* Table 2).

Coal dust in the dark						
Intermediate time (min)	$[Co]_{out} - [Co]_{in}$ (nM) corrected from blank	Stdev	Dissolution rate (%/min)	Absolute error	Solubility (%)	Absolute error
3	1.898	0.022	0.048%	0.003%	0.19%	0.01%
6	1.799	0.039	0.029%	0.011%	0.27%	0.02%
8	2.108	0.043	0.056%	0.017%	0.36%	0.04%
10	1.505	0.022	-0.002%	0.014%	0.41%	0.05%
12	1.127	0.121	0.002%	0.011%	0.41%	0.05%
15	0.999	0.043	0.012%	0.008%	0.42%	0.05%
21	0.385	0.035	0.001%	0.003%	0.48%	0.05%
31	0.282	0.030	0.004%	0.002%	0.51%	0.05%
43.5	0.239	0.124	0.004%	0.002%	0.56%	0.05%
58.5	0.173	0.022	0.002%	0.001%	0.61%	0.05%
81	0.051	0.022	0.000%	0.001%	0.64%	0.06%
111	0.346	0.021	0.006%	0.001%	0.73%	0.06%
Coal dust with light irradiation						
3.15	2.556	0.026	0.061%	0.004%	0.26%	0.01%
6.3	2.512	0.000	0.044%	0.014%	0.37%	0.03%
8.3	1.482	0.118	-0.024%	0.014%	0.39%	0.04%
10.3	1.422	0.173	0.024%	0.013%	0.38%	0.05%
12.3	1.288	0.185	0.018%	0.012%	0.43%	0.05%
15.3	0.930	0.022	-0.001%	0.007%	0.44%	0.04%
21.3	0.461	0.029	0.004%	0.003%	0.46%	0.05%
31.3	0.205	0.073	0.001%	0.002%	0.48%	0.05%
43.8	0.295	0.067	0.006%	0.002%	0.53%	0.05%
58.8	0.276	0.016	0.004%	0.002%	0.60%	0.05%
81.3	0.211	0.062	0.003%	0.001%	0.71%	0.06%
111.3	0.178	0.030	0.002%	0.001%	0.78%	0.06%

Loess in the dark						
Intermediate time (min)	[Co]_{out} - [Co]_{in} (nM) corrected from blank	Stdev	Dissolution rate (%/min)	Absolute error	Solubility (%)	Absolute error
3.25	0.094	0.025	0.003%	0.001%	0.01%	0.00%
6.5	< DL	0.053	0.000%	0.003%	0.01%	0.00%
8.5	< DL	0.016	0.000%	0.005%	0.00%	0.01%
10.5	< DL	0.004	0.000%	0.006%	0.00%	0.02%
12.5	< DL	0.006	0.000%	0.005%	0.00%	0.02%
15.5	< DL	0.063	0.000%	0.004%	0.00%	0.02%
21.5	0.046	0.057	0.001%	0.002%	0.01%	0.03%
31.5	0.072	0.026	0.002%	0.002%	0.02%	0.03%
44	0.093	0.134	0.002%	0.002%	0.05%	0.04%
81.5	0.088	0.043	0.002%	0.001%	0.07%	0.05%
112	0.206	0.038	0.003%	0.001%	0.14%	0.06%
Loess with light irradiation						
3	0.106	0.034	0.003%	0.001%	0.01%	0.00%
6	0.158	0.067	0.007%	0.005%	0.02%	0.01%
8	0.078	0.020	-0.003%	0.006%	0.03%	0.01%
10	0.108	0.062	0.004%	0.006%	0.03%	0.02%
12	0.131	0.032	0.004%	0.006%	0.03%	0.02%
15	0.121	0.047	0.002%	0.004%	0.04%	0.02%
31	0.008	0.004	0.000%	0.002%	0.04%	0.03%
43.5	0.070	0.042	0.002%	0.002%	0.05%	0.04%
81	0.066	0.145	0.001%	0.001%	0.07%	0.05%
111	0.194	0.030	0.003%	0.001%	0.14%	0.06%

Annexe 4: Zinc from coal dust with and without light irradiation. $[Zn]_{out}$: Zinc concentration measured at the exit of the reactor; $[Zn]_{in}$: Zinc concentration naturally present in the seawater used for the dissolution experiments. These concentrations are corrected from the blank concentrations. To obtain the dissolution rate in nmol/min instead of %/min, the dissolution in %/min has to be multiplied by the bulk concentration of the selected dust (*cf.* Table 2).

Coal dust with light irradiation						
Intermediate time (min)	$[Zn]_{out} - [Zn]_{in}$ (nM) corrected from blank	Stdev	Dissolution rate (%/min)	Absolute error	Solubility (%)	Absolute error
3.2	39.898	1.262	0.300%	0.016%	1.29%	0.06%
6.3	27.905	1.280	-0.031%	0.041%	1.56%	0.10%
8.3	28.466	1.401	0.183%	0.061%	1.71%	0.16%
10.3	23.627	1.401	0.062%	0.051%	1.96%	0.18%
12.3	17.442	0.821	0.006%	0.040%	2.03%	0.18%
15.3	13.984	0.706	0.026%	0.024%	2.06%	0.16%
21.3	5.162	0.238	0.002%	0.007%	2.20%	0.16%
31.3	6.834	0.104	0.044%	0.006%	2.42%	0.16%
43.8	7.718	0.402	0.043%	0.006%	3.07%	0.17%
58.8	5.821	0.535	0.024%	0.004%	3.58%	0.16%
81.3	6.466	0.179	0.031%	0.004%	4.41%	0.19%
111.3	5.382	0.104	0.019%	0.003%	5.16%	0.19%
Loess with light irradiation						
3.0	2.749	0.195	0.162%	0.018%	0.65%	0.03%
6.0	4.453	0.148	0.395%	0.077%	1.20%	0.13%
8.0	0.533	0.419	-0.442%	0.051%	1.16%	0.16%
10.0	0.301	0.128	-0.014%	0.049%	0.70%	0.18%
12.0	0.775	0.164	0.089%	0.055%	0.78%	0.20%
15.0	0.733	0.015	0.026%	0.039%	0.89%	0.20%
21.0	1.662	0.155	0.088%	0.029%	1.46%	0.34%
31.0	1.676	0.140	0.060%	0.020%	2.20%	0.38%
43.5	2.777	0.275	0.111%	0.021%	3.48%	0.49%
58.5	4.643	0.024	0.181%	0.025%	5.67%	0.61%
81.0	4.951	0.131	0.162%	0.022%	10.81%	0.88%
111.0	7.097	0.203	0.202%	0.022%	16.27%	1.07%