

Figure S1. XRD pattern of natural goethite powder heated at 450 °C in furnace for 1 hr.

Table S1. XRD data in tabular form of natural goethite powder heated at 450 °C in furnace for 1 hr.

[jps7-2.raw] - Chemistry 12hr scan											Peak ID Report	
SCAN: 15.0/80.0/0.02/1/2(sec), Cu(40kV,30mA), I(max)=72220, 10/18/18 03:24												
PEAK: 19-pts/Parabolic Filter, Threshold=1.5, Cutoff=1.5%, BG=3/1.0, Peak-Top=Summit												
NOTE: Intensity = Counts, 2 θ (0)=0.0(deg), Wavelength to Compute d-Spacing = 1.54056Å (Cu/K-alpha1)												
#	2-Theta	d(Å)	Height	height%	Phase ID	d(Å)	I%	(h k l)	2-Theta	Delta		
1	20.665	4.2946	16054	22.2	Quartz, syn	4.2875	16.0	(1 0 0)	20.699	0.034		
2	23.941	3.7139	1300	1.8	Hematite, syn	3.7021	30.0	(0 1 2)	24.018	0.077		
3	26.458	3.3659	72194	100.0	Quartz, syn	3.3633	100.0	(1 0 1)	26.479	0.021		
4	31.821	2.8098	416	0.6								
5	32.921	2.7184	4517	6.3	Hematite, syn	2.7095	100.0	(1 0 4)	33.032	0.111		
6	35.461	2.5294	7390	10.2	Hematite, syn	2.5272	70.0	(1 1 0)	35.491	0.031		
7	36.363	2.4686	8379	11.6	Quartz, syn	2.4673	9.0	(1 1 0)	36.383	0.020		
8	39.277	2.2919	5432	7.5	Quartz, syn	2.2904	8.0	(1 0 2)	39.304	0.027		
9	40.098	2.2469	3997	5.5	Quartz, syn	2.2447	4.0	(1 1 1)	40.139	0.041		
10	40.681	2.2160	2527	3.5	Hematite, syn	2.2132	20.0	(1 1 3)	40.734	0.054		
11	42.277	2.1359	5773	8.0	Quartz, syn	2.1354	6.0	(2 0 0)	42.289	0.012		
12	45.281	2.0010	931	1.3								
13	45.582	1.9885	2807	3.9	Quartz, syn	1.9864	4.0	(2 0 1)	45.632	0.050		
14	49.260	1.8483	1507	2.1	Hematite, syn	1.8448	40.0	(0 2 4)	49.359	0.099		
15	49.960	1.8240	14978	20.7	Quartz, syn	1.8234	13.0	(1 1 2)	49.978	0.018		
16	53.880	1.7002	4246	5.9	Hematite, syn	1.6976	45.0	(1 1 6)	53.969	0.089		
17	54.680	1.6772	1859	2.6	Quartz, syn	1.6762	4.0	(2 0 2)	54.713	0.033		
18	55.139	1.6643	1388	1.9	Quartz, syn	1.6636	2.0	(1 0 3)	55.163	0.024		
19	57.359	1.6050	439	0.6	Hematite, syn	1.6064	5.0	(1 2 2)	57.308	-0.052		
20	59.794	1.5454	13122	18.2	Quartz, syn	1.5453	9.0	(2 1 1)	59.798	0.004		
21	62.259	1.4900	1252	1.7	Hematite, syn	1.4885	30.0	(2 1 4)	62.329	0.070		
22	63.858	1.4565	4344	6.0	Hematite, syn	1.4562	30.0	(3 0 0)	63.869	0.011		
23	67.562	1.3854	6524	9.0	Quartz, syn	1.3850	6.0	(2 1 2)	67.582	0.020		
24	67.962	1.3782	10157	14.1	Quartz, syn	1.3778	7.0	(2 0 3)	67.982	0.020		
25	71.759	1.3143	496	0.7	Hematite, syn	1.3134	10.0	(1 0 10)	71.815	0.056		
26	72.058	1.3096	289	0.4	Hematite, syn	1.3083	6.0	(1 1 9)	72.140	0.083		
27	75.480	1.2585	2717	3.8	Quartz, syn	1.2582	3.0	(3 0 2)	75.498	0.018		
28	77.516	1.2304	2039	2.8	Quartz, syn	1.2305	1.0	(2 2 0)	77.513	-0.003		

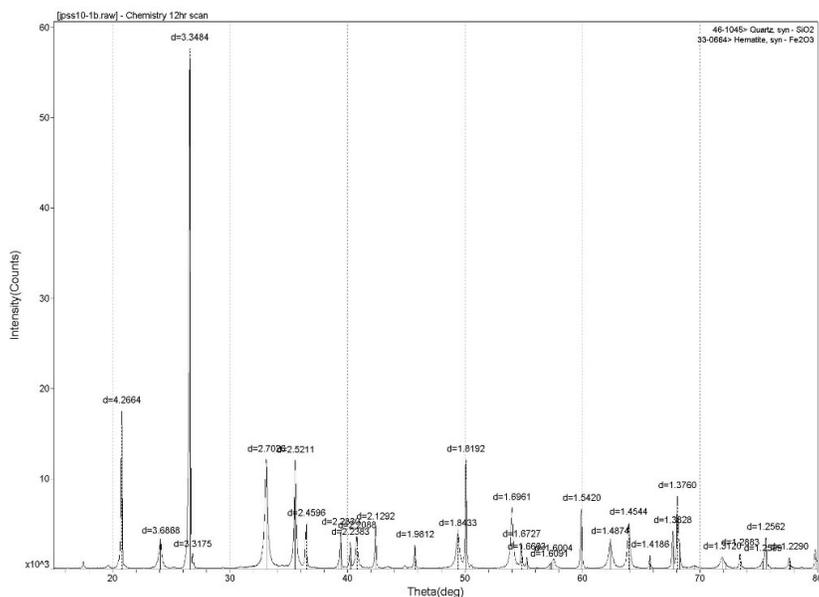


Figure S2. XRD pattern of natural goethite powder heated at 900 °C in furnace for 1 hr.

Table S2. XRD data in tabular form of natural goethite powder heated at 900 °C in furnace for 1 hr.

[pss10-1a.raw] - Chemistry 12hr scan											Peak ID Report
SCAN: 15.0/60.0/0.02/12(sec), Cu(40kV,30mA), I(max)=53676, 11/07/16 07:33											
PEAK: 17-pts/Parabolic Filter, Threshold=1.5, Cutoff=1.5%, BG=3/1.0, Peak-Top=Summit											
NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.54056Å (Cu/K-alpha1)											
#	2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	I%	(h k l)	2-Theta	Delta	
1	20.802	4.2665	13503	25.2	Quartz, syn	4.2550	16.0	(1 0 0)	20.859	0.057	
2	24.101	3.6896	2942	5.5	Hematite, syn	3.6930	30.0	(0 1 2)	24.078	-0.023	
3	26.601	3.3482	53659	100.0	Quartz, syn	3.3435	100.0	(1 0 1)	26.639	0.039	
4	33.120	2.7025	11697	21.8	Hematite, syn	2.7048	100.0	(1 0 4)	33.092	-0.028	
5	35.599	2.5198	11298	21.1	Hematite, syn	2.5231	70.0	(1 1 0)	35.551	-0.048	
6	36.536	2.4573	7713	14.4	Quartz, syn	2.4569	9.0	(1 1 0)	36.543	0.007	
7	39.440	2.2828	5059	9.4	Quartz, syn	2.2815	8.0	(1 0 2)	39.464	0.024	
8	40.259	2.2383	2476	4.6	Quartz, syn	2.2361	4.0	(1 1 1)	40.299	0.040	
9	40.839	2.2078	3446	6.4	Hematite, syn	2.2101	20.0	(1 1 3)	40.794	-0.044	
10	42.420	2.1291	3670	6.8	Quartz, syn	2.1277	6.0	(2 0 0)	42.449	0.029	
11	45.779	1.9804	3426	6.4	Quartz, syn	1.9799	4.0	(2 0 1)	45.792	0.012	
12	49.439	1.8420	3769	7.0	Hematite, syn	1.8427	40.0	(0 2 4)	49.419	-0.020	
13	50.102	1.8192	9697	18.1	Quartz, syn	1.8180	13.0	(1 1 2)	50.138	0.036	
14	54.040	1.6955	6701	12.5	Hematite, syn	1.6958	45.0	(1 1 6)	54.029	-0.011	
15	54.840	1.6727	3249	6.1	Quartz, syn	1.6717	4.0	(2 0 2)	54.873	0.033	
16	55.299	1.6599	956	1.8	Quartz, syn	1.6592	2.0	(1 0 3)	55.323	0.024	
17	57.203	1.6090	419	0.8	Quartz, syn	1.6083	1.0	(2 1 0)	57.234	0.030	
18	57.579	1.5994	1018	1.9	Hematite, syn	1.6007	10.0	(0 1 8)	57.529	-0.050	
19	59.923	1.5424	6709	12.5	Quartz, syn	1.5415	9.0	(2 1 1)	59.958	0.036	
20	62.382	1.4873	2955	5.5	Hematite, syn	1.4872	30.0	(2 1 4)	62.389	0.007	
21	63.980	1.4540	4892	9.1	Hematite, syn	1.4550	30.0	(3 0 0)	63.929	-0.051	
22	67.720	1.3825	3304	6.2	Quartz, syn	1.3821	6.0	(2 1 2)	67.742	0.022	
23	68.121	1.3753	3728	6.9	Quartz, syn	1.3750	7.0	(2 0 3)	68.142	0.021	
24	71.960	1.3111	1256	2.3	Hematite, syn	1.3124	10.0	(1 0 10)	71.875	-0.084	
25	73.442	1.2883	1273	2.4	Quartz, syn	1.2879	2.0	(1 0 4)	73.466	0.023	
26	75.421	1.2593	999	1.9	Hematite, syn	1.2601	8.0	(2 2 0)	75.368	-0.053	
27	75.640	1.2562	2342	4.4	Quartz, syn	1.2559	3.0	(3 0 2)	75.658	0.017	
28	77.678	1.2283	1287	2.4	Quartz, syn	1.2283	1.0	(2 2 0)	77.673	-0.005	