

Supplementary Materials

Table S1. LA-ICP-MS analyses of various pyrite generations from the Luyuangou gold deposit

No.	Type	Ti	Co	Ni	CO/Ni	Cu	Zn	As	Ag	Sb	Au	Pb	Bi
L30-1-01	Py1-1	21.957	43.116	13.960	3.089	2.436	1.718	0.723	0.016	2.318	0.000	54.436	0.028
L30-1-02	Py1-1	4.476	26.069	5.452	4.781	2.601	5.052	0.889	0.044	1.767	0.023	49.480	0.049
L30-1-03	Py1-1	289.911	18.427	17.478	1.054	7.973	43.110	40.478	4.728	3.915	0.057	203.581	0.012
L30-1-04	Py1-1	43.049	20.241	30.092	0.673	31.561	79.208	34.524	9.924	8.983	0.116	507.632	0.028
L30-1-05	Py1-1	9.140	5.700	3.300	1.727	1.010	3.700	3.600	10.582	0.038	0.090	0.080	0.072
L30-1-06	Py1-1	10.378	36.004	9.072	3.968	24.827	3.510	2.068	0.710	2.543	0.000	69.938	0.017
L30-1-07	Py1-1	77.003	8.025	11.025	0.728	2.071	2.197	1.315	0.843	0.734	0.052	24.642	0.015
L30-1-08	Py1-1	84.031	86.011	98.238	0.876	2.769	0.874	0.836	0.316	1.011	0.011	18.516	0.000
L30-2-01	Py1-1	622.397	151.604	12.110	12.519	72.336	6.634	5.089	171.892	4.857	0.290	2756.834	0.245

L30-2-02	Py1-1	3.245	46.279	17.087	2.708	3.249	1.780	1.533	1.449	2.191	0.029	81.414	0.004
L30-2-03	Py1-1	3.451	19.177	18.013	1.065	0.728	1.823	1.227	0.306	0.420	0.012	11.592	0.003
L30-1-09	Py1-2	5.666	46.544	4.254	10.942	0.584	1.186	1.456	0.016	0.495	0.000	13.130	0.007
L30-1-10	Py1-2	20.361	12.880	15.260	0.844	176.895	74.683	42.159	25.367	2.081	0.051	59.931	0.010
L30-1-11	Py1-2	85.267	3.866	3.595	1.075	7.670	71.986	39.757	4.018	1.734	0.013	149.872	0.008
L30-1-12	Py1-2	16.112	1.499	4.226	0.355	2.232	4.094	1.915	2.521	0.149	0.057	6.851	0.000
L30-1-13	Py1-2	4.863	4.297	3.710	1.158	4.805	1.582	29.773	0.020	0.000	0.016	0.110	0.011
L30-1-14	Py1-2	4.642	56.739	36.468	1.556	1.290	2.252	0.000	0.045	0.102	0.005	1.827	0.000
L30-1-15	Py1-2	5.392	0.876	0.677	1.293	0.385	1.739	0.484	0.340	0.124	0.022	4.700	0.003
L30-1-16	Py1-2	77.998	80.278	27.297	2.941	2.901	2.551	1.578	0.622	1.500	0.000	42.191	0.006
L30-2-04	Py1-2	14.437	0.000	0.000	0.000	27.237	34.072	15.204	22.105	15.711	0.398	4453.609	2.963
L30-2-05	Py1-2	4.468	38.729	13.665	2.834	12.064	2.494	0.695	112.779	1.222	0.845	7207.926	0.775

L30-2-06	Py1-2	103.578	22.075	32.026	0.689	27.468	12.195	11.470	7.816	5.422	0.100	345.122	0.017
L30-2-07	Py1-2	2.629	48.610	19.434	2.501	2.871	1.704	1.788	1.373	1.466	0.051	48.168	0.002
L30-2-08	Py1-2	4.785	17.141	11.475	1.494	3.441	2.408	9.180	3.881	0.685	0.029	27.630	0.000
L30-2-09	Py1-2	5.271	8.658	7.755	1.116	2.599	2.652	9.794	2.033	1.992	0.076	62.258	0.012
L30-2-10	Py1-2	353.222	7.804	11.509	0.678	3.669	1.005	17.914	1.692	1.176	0.067	32.377	0.020
850-2-01	Py2	5905.537	137.393	74.238	1.851	80.080	25.544	5928.279	107.541	85.290	2.002	733.480	0.161
850-2-02	Py2	60.319	63.168	50.582	1.249	81.870	11.709	8021.926	28.369	14.659	1.993	359.576	0.015
850-2-03	Py2	10938.207	152.496	70.683	2.157	98.414	8.420	5291.908	102.306	124.158	1.042	776.779	0.038
850-2-04	Py2	179.052	79.012	51.356	1.539	62.123	5.500	4763.258	27.655	22.879	1.868	2662.411	0.063
850-2-05	Py2	260.122	78.823	90.730	0.869	130.894	18.351	4696.616	17.042	20.552	1.895	656.293	0.041
850-2-06	Py2	198.432	175.318	222.34	0.789	143.755	40.895	3206.214	43.093	36.608	1.855	893.703	0.060
820-1-01	Py2	5.398	34.364	49.129	0.699	38.111	6.976	5241.525	2.702	48.035	0.135	2181.131	0.012

820-1-02	Py2	3.466	75.266	105.105	0.716	49.112	9.010	3778.732	3.133	78.262	0.250	68.605	0.009
820-1-03	Py2	3.371	51.977	56.806	0.915	33.203	3381.486	5770.019	9.623	50.470	0.605	8073.892	0.010
820-1-04	Py2	2.198	19.166	35.639	0.538	12.582	2.440	6909.785	1.433	67.132	0.052	98.600	0.008
820-1-05	Py2	8.854	69.878	90.875	0.769	54.967	60282.629	3427.082	4.131	56.784	0.397	134.086	0.002
820-1-06	Py2	4.030	41.981	43.245	0.971	33.483	8.383	8476.713	8.995	119.395	0.287	6428.146	0.017
820-1-07	Py2	6.220	57.027	58.472	0.975	41.479	14.204	3731.478	8.053	47.830	0.294	4302.967	0.016
820-1-08	Py2	7.317	42.792	37.050	1.155	41.316	3.770	6510.101	5.649	77.929	0.219	3715.138	0.013
820-1-09	Py2	658.493	53.881	52.330	1.030	24.572	8.104	6621.725	6.824	86.717	0.233	2233.195	0.002
820-1-10	Py2	2323.245	28.056	23.329	1.203	13.936	3.604	2966.867	4.263	38.399	0.195	1990.185	0.005
820-1-11	Py2	59.531	77.303	102.265	0.756	24.337	8.078	6197.820	5.747	85.819	0.312	4162.959	0.014
820-1-12	Py2	2.382	28.648	34.117	0.840	17.509	4.231	7995.637	1.183	65.930	0.206	313.825	0.022
820-2-01	Py2	43.490	94.724	65.201	1.453	184.777	31.464	1882.618	21.855	41.476	1.299	30087.502	0.047

820-2-02	Py2	55.644	86.361	57.712	1.496	156.929	158.195	1904.040	7.914	61.668	0.347	2457.984	0.016
820-2-03	Py2	135.041	6.064	9.554	0.635	13.651	13.615	72.639	0.791	4.005	0.022	147.707	0.006
820-2-04	Py2	4.632	57.700	32.038	1.801	159.481	34.370	4681.711	11.275	38.613	0.625	13502.028	0.019
820-4-01	Py2	8.967	54.288	48.410	1.121	355.763	44.002	2110.939	12.541	208.132	0.387	423.594	0.066
820-4-02	Py2	3.248	40.167	59.759	0.672	214.930	50.252	4449.564	18.865	196.378	1.508	136.420	0.034
820-4-03	Py2	17.282	25.491	57.955	0.440	961.954	430.637	6097.655	97.748	624.007	2.215	19035.658	0.214
820-4-04	Py2	3379.914	44.395	64.986	0.683	127.790	92.902	4645.046	33.476	267.035	12.522	1064.501	0.017
820-4-05	Py2	737.109	20.167	38.426	0.525	558.872	25.322	4299.768	59.866	360.716	12.095	295.850	0.000
820-4-06	Py2	591.477	66.749	79.027	0.845	194.459	13.367	2991.103	60.601	195.102	10.308	560.014	0.020
820-4-07	Py2	2122.13	55.786	75.129	0.743	109.456	16.311	4912.537	44.863	215.150	6.518	4423.070	0.053
820-13-01	Py2	204.361	56.726	142.10	0.399	89.276	1659.867	6451.508	623.286	125.527	11.244	280.806	0.000
820-13-02	Py2	439.696	59.827	49.179	1.217	82.596	83.314	6295.457	71.088	98.194	4.817	12646.905	0.327

820-13-03	Py2	143.120	83.883	130.285	0.644	148.507	1175.219	10135.863	38.722	155.221	8.612	455.104	0.023
820-13-04	Py2	9.697	68.355	294.411	0.232	113.034	36.538	9924.637	1161.607	150.868	17.024	707.919	0.022
820-13-05	Py2	4.689	53.957	249.245	0.216	187.591	233.190	9502.092	1009.620	203.734	21.410	758.432	0.045
820-13-06	Py2	44.737	58.894	212.443	0.277	125.410	408.333	9891.104	386.126	91.111	4.501	4361.294	0.103
820-13-07	Py2	2178.968	11.486	21.569	0.533	24.911	9.529	6518.012	8.750	80.450	3.989	74.186	0.008
820-13-08	Py2	1619.965	56.365	110.549	0.510	67.962	97.391	11611.537	28.132	131.142	2.995	345.058	0.022
820-13-09	Py2	1685.375	35.021	138.175	0.253	70.971	11.284	9076.212	41.960	171.876	3.861	684.518	0.031
820-8-01	Py3	2.838	10.136	5.500	1.843	1024.131	140.186	4436.026	105.420	1480.013	6.803	4736.698	0.018
820-8-02	Py3	3.165	5.119	2.996	1.709	241.947	43.602	6096.066	32.760	874.727	17.565	1783.509	0.006
820-8-03	Py3	3.810	7.456	3.595	2.074	118.408	30.899	12261.422	26.632	1216.272	2.008	2684.400	0.020
820-8-04	Py3	4.796	8.090	8.551	0.946	69.370	18.891	15917.496	25.997	422.863	75.937	3526.251	0.007
820-8-05	Py3	99.757	54.995	16.725	3.288	8548.844	36.977	4740.764	134.548	305.886	1.420	146751.631	0.154

820-8-06	Py3	6.144	17.424	10.327	1.687	119.249	404.903	15255.124	47.777	1216.842	0.900	7415.808	0.059
820-8-07	Py3	5.225	12.563	3.403	3.692	229.661	48.747	13468.760	43.877	1024.565	3.707	31109.991	0.046
820-8-08	Py3	2.807	4.201	1.230	3.414	25.898	15.114	16706.804	13.164	813.567	2.170	50404.724	0.070
820-8-09	Py3	2.497	0.265	0.167	1.582	8.588	257.505	12731.665	2.770	397.591	0.471	536.332	0.002
820-8-10	Py3	13.579	20.174	6.793	2.970	473.530	40688.877	4094.400	229.410	631.119	3.527	3072.955	0.050
820-9-01	Py3	6.434	24.640	3.062	8.047	40.789	84556.798	9887.563	50.514	20.734	2.715	1630.088	0.080
820-9-02	Py3	4.419	0.000	0.000	0.000	15.745	0.000	15187.626	0.213	41.172	1.096	42.767	0.000
820-9-03	Py3	3.704	11.673	4.127	2.828	344.650	3465.104	10250.782	151.202	478.717	4.984	2865.826	0.000
820-9-04	Py3	230.907	28.539	17.882	1.596	185.302	7239.622	4761.371	138.947	284.606	3.001	2137.164	0.007
820-9-05	Py3	2.716	1.540	2.791	0.552	139.649	28.893	15721.405	17.609	713.921	1.528	1589.283	0.004
820-9-06	Py3	4.816	1.688	1.108	1.524	77.961	146.547	15589.224	11.115	109.074	0.260	322.124	0.004
820-9-07	Py3	2.288	13.360	2.682	4.982	2338.980	109036.359	14782.898	250.582	2033.289	0.633	789.522	0.004

820-9-08	Py3	4.939	1.462	0.854	1.711	25.816	37.412	6317.830	7.942	19.082	7.811	99.538	0.008
820-9-09	Py3	2.653	42.372	18.585	2.280	499.706	19.157	6704.885	347.560	837.645	3.961	14886.902	0.047
820-9-10	Py3	2.477	3.909	1.861	2.100	26.020	6.822	10776.450	36.938	45.152	0.529	686.714	0.009
820-9-11	Py3	3.608	14.417	6.723	2.144	160.574	1220.409	11416.602	98.907	156.818	0.711	15460.160	0.015
820-9-12	Py3	4.902	26.474	10.922	2.424	199.423	48.543	10295.094	145.544	978.829	3.771	159346.173	0.183
820-8-13	Py3	1.882	34.084	12.938	2.634	238.813	36.852	9390.229	190.011	324.938	2.438	135102.691	0.114
820-8-14	Py3	3.275	6.458	1.975	3.270	192.020	120.720	3464.836	83.723	1046.482	0.685	2934.074	0.005
1110-6-01	Py4	106.100	79.613	15.888	5.011	34.885	67.674	33.273	23.324	3.285	0.109	156.111	0.027
1110-6-02	Py4	4.787	4.643	92.017	0.050	4.728	5.785	11.072	7.083	0.354	0.125	10.401	0.010
1110-6-03	Py4	254.722	256.089	23.745	10.785	41.936	38.720	34.916	80.362	4.188	0.407	174.816	0.067
1110-6-04	Py4	626.524	112.052	15.015	7.463	33.896	38.056	51.949	38.707	2.886	0.250	708.597	0.338
1110-6-05	Py4	2565.77	56.943	8.302	6.859	35.021	77.102	13.178	17.467	3.280	0.063	368.661	0.061

1110-6-06	Py4	144.836	147.497	12.249	12.042	43.994	57.902	19.134	13.904	3.858	0.077	213.201	0.044
1110-6-07	Py4	4.492	7.561	2.231	3.389	0.521	4.060	7.782	0.048	0.046	0.005	0.179	0.030
1110-6-08	Py4	3.389	76.043	5.389	14.110	0.774	3.319	118.591	0.000	0.000	0.011	0.119	0.098
1110-6-09	Py4	4.435	103.553	20.442	5.066	0.072	5.241	6.763	0.191	0.000	0.020	0.316	0.014
1110-6-10	Py4	3.679	157.323	5.394	29.164	1.491	3.307	149.147	2.679	0.270	0.037	2.610	0.009
1110-6-11	Py4	207.918	63.700	14.965	4.257	35.647	75.691	24.922	21.097	5.003	0.294	491.586	0.050
1110-6-12	Py4	715.887	95.735	11.665	8.207	40.896	54.776	15.329	15.017	4.098	0.084	234.446	0.066
1110-7-01	Py4	123.995	208.249	17.208	12.102	43.414	42.538	23.056	18.629	3.907	0.082	168.762	0.057
1110-7-02	Py4	4.726	29.008	4.417	6.567	0.110	1.920	1.795	0.149	0.000	0.000	0.000	0.003
1110-7-03	Py4	6.977	69.332	30.070	2.306	10.156	181.714	5.281	4.744	1.384	0.028	182.339	0.022
1110-7-04	Py4	11.958	94.409	41.377	2.282	9.381	102.923	11.749	5.655	1.486	0.049	273.281	0.044
1110-7-05	Py4	4.417	33.475	35.609	0.940	9.558	18.617	12.494	6.579	2.286	0.015	194.423	0.044

1110-7-06	Py4	3.318	13.107	37.142	0.353	0.419	8.923	11.129	0.084	0.000	0.010	6.062	0.007
1110-7-07	Py4	2.399	6.109	34.972	0.175	0.316	2.332	75.246	0.417	0.000	0.014	0.361	0.001
1110-7-08	Py4	5.395	4.735	9.377	0.505	1.061	1.664	25.182	1.108	0.341	0.000	5.723	0.000
1110-7-09	Py4	5.845	40.331	31.707	1.272	11.706	27.063	4.693	37.147	0.635	0.073	159.896	0.020

*0 = below detection limit.

Table S2. Composition of sulfur isotopes (‰) of various pyrite generations in the
Luyuangou gold deposit

No.	Type	$^{34}\text{S}/^{32}\text{S}$	Error	$^{33}\text{S}/^{32}\text{S}$	Error	$^{32}\text{S}(\text{V})$	$\delta^{34}\text{S}$	SD
01	Py1-1	0.046837	3.87E-06	0.008169	1.19E-06	18.2	0.559895	0.826264
02	Py1-1	0.046889	6.8E-06	0.008168	2.3E-06	14.9	1.652456	1.450249
03	Py1-1	0.04694	3.67E-06	0.008161	1.19E-06	17.6	1.008662	0.781852
04	Py1-1	0.046938	4.46E-06	0.00816	1.29E-06	18.5	0.977341	0.950182
05	Py1-1	0.047096	4.58E-06	0.008168	1.11E-06	18.6	1.030176	0.972479
06	Py1-2	0.046899	3.6E-06	0.008171	1.13E-06	18.8	1.878054	0.767606
07	Py1-2	0.046882	3.24E-06	0.008176	1.21E-06	18.1	1.510096	0.691099
08	Py1-2	0.046877	4.04E-06	0.008151	1.1E-06	17.9	-0.31978	0.861821
09	Py1-2	0.047033	3.95E-06	0.008166	1.27E-06	18.8	-0.30896	0.839835
10	Py1-2	0.047272	6.81E-06	0.008176	1.32E-06	18.9	0.483016	1.44059
11	Py1-2	0.047287	4.63E-06	0.008178	1.31E-06	18.7	0.795754	0.979126
12	Py2	0.046705	9.71E-06	0.008116	1.62E-06	19	-11.5196	1.079021
13	Py2	0.047213	8.1E-06	0.008154	1.87E-06	17.9	-8.16208	1.715612
14	Py2	0.047078	0.000003	0.008142	3.03E-06	18.9	-11.0079	0.637242
15	Py2	0.047121	1.13E-06	0.008142	1.58E-06	19.5	-10.0947	0.239806
16	Py2	0.047132	1.35E-06	0.008158	2.2E-06	18.5	-11.1014	0.286427
17	Py2	0.047083	9.62E-06	0.008146	1.46E-06	18.5	-12.1317	1.043186
18	Py2	0.047371	1.11E-06	0.008172	1.56E-06	19.3	-6.09581	0.234319

19	Py2	0.047326	6.66E-06	0.008171	1.87E-06	18.3	-7.03869	1.407252
20	Py2	0.047048	7.23E-06	0.008139	1.53E-06	18.8	-13.0193	1.536719
21	Py2	0.047054	5.82E-06	0.008139	1.34E-06	19.3	-12.9057	1.236884
22	Py2	0.046996	5.97E-06	0.008136	1.16E-06	19.4	-14.1253	1.270334
23	Py2	0.047049	1.34E-06	0.008136	1.73E-06	18.8	-15.4004	0.284808
24	Py2	0.047099	5.75E-06	0.008143	1.9E-06	17.7	-14.3642	1.220838
25	Py2	0.047192	6.97E-06	0.008156	1.42E-06	17.2	-12.4168	1.476947
26	Py3	0.046926	4.19E-06	0.00813	0.000001	18.9	-19.4921	0.892893
27	Py3	0.047078	4.81E-06	0.00815	1.16E-06	18.7	-16.3223	1.02171
28	Py3	0.047145	5.07E-06	0.008148	1.2E-06	19.7	-14.9199	1.075403
29	Py3	0.046953	4.77E-06	0.00814	1.38E-06	18.6	-18.9322	1.015911
30	Py3	0.04715	7.2E-06	0.008158	1.41E-06	20.6	-14.9156	1.52704
31	Py3	0.047086	5.65E-06	0.008151	1.52E-06	19.2	-16.2574	1.199938
32	Py3	0.046963	4.44E-06	0.00814	1.1E-06	18.6	-18.8273	0.945432
33	Py3	0.047271	4.2E-06	0.008176	1.3E-06	19.8	-12.3885	0.888492
34	Py3	0.047153	5.21E-06	0.008144	1.72E-06	18.6	-14.862	1.104923
35	Py4	0.048186	5.21E-06	0.008245	1.6E-06	17.9	3.170546	1.081234
36	Py4	0.048159	6.58E-06	0.00824	2.21E-06	13.6	2.615598	1.366307
37	Py4	0.048187	5.05E-06	0.008251	2.72E-06	10.4	3.198834	1.047999
38	Py4	0.04816	7.19E-06	0.008241	1.78E-06	17.3	2.64139	1.492932
39	Py4	0.048086	4.62E-06	0.008234	1.31E-06	17.9	1.088033	0.960787

40	Py4	0.048205	6.17E-06	0.008244	1.43E-06	17.2	3.35586	1.279947
41	Py4	0.048209	4.87E-06	0.008251	2.25E-06	10.9	3.43114	1.01019
42	Py4	0.048195	5.37E-06	0.008236	2.12E-06	12.3	3.136196	1.114234
