

Table S1. Sample information from the Longshan Sb-Au deposit, South China.

Sample No.	Mining zone	Mineral	Mineralization stage	Mine level	Orebody No.	Mineral assemblage
XJS-22	XJS	Scheelite	Stage-3	298	4	Euhedral scheelite + stibnite
XJS-23	XJS	Scheelite	Stage-3	298	4	Euhedral scheelite + stibnite
XJS-28	XJS	Scheelite	Stage-3	298	4	Euhedral scheelite + stibnite
XJS-28-1	XJS	Scheelite	Stage-3	298	4	Euhedral scheelite + stibnite
XJS-26	XJS	Scheelite	Stage-3	298	4	Scheelite + wolframite
XJS-36	XJS	Scheelite	Stage-3	298	4	Scheelite + pyrite + stibnite
XJS-37	XJS	Scheelite	Stage-3	298	4	Scheelite + pyrite + stibnite
XJS-37-1	XJS	Scheelite	Stage-3	298	4	Scheelite + pyrite + stibnite
XJS-70	XJS	Scheelite	Stage-3	298	4	Scheelite + pyrite + stibnite
XJS-72	XJS	Scheelite	Stage-3	298	4	Scheelite + pyrite + stibnite
XJS-77	XJS	Scheelite	Stage-3	298	4	Scheelite + pyrite + stibnite
LS-11	LS	Arsenopyrite	Stage-3	430	1	Auriferous disseminated arsenopyrite
LS-52	LS	Arsenopyrite	Stage-3	430	1	Auriferous disseminated arsenopyrite
LS-53	LS	Arsenopyrite	Stage-3	430	1	Auriferous disseminated arsenopyrite + stibnite
LS-57	LS	Arsenopyrite	Stage-4	720	7	Auriferous disseminated arsenopyrite
LS-58	LS	Arsenopyrite	Stage-4	720	7	Auriferous disseminated arsenopyrite
LS-60	LS	Arsenopyrite	Stage-4	720	7	Auriferous disseminated arsenopyrite
XJS-94	XJS	Pyrite	Stage-3	298	4	Auriferous pyrite + stibnite

XJS = Xiejiashan, LS = Longshan

Table S2. Average minimum detection limits and dwell time for scheelite LA-ICP-MS spot analyses from the Longshan Sb-Au deposit, South China.

Isotope	Average detection limit/spot (sec.)	dwell time/spot (sec.)	Uncertainty Percent (%)
²³ Na	0.535	0.01	8.75
⁸⁸ Sr	0.008	0.02	0.597
⁸⁹ Y	0.0001	0.01	0.970
⁹⁵ Mo	0.0006	0.02	22.1
¹³⁹ La	0.00005	0.02	1.08
¹⁴⁰ Ce	0.00005	0.02	0.811
¹⁴¹ Pr	0.00002	0.02	1.41
¹⁴⁶ Nd	0.0002	0.02	1.47
¹⁴⁷ Sm	0.0003	0.02	2.02
¹⁵³ Eu	0.0001	0.02	1.63
¹⁵⁷ Gd	0.0004	0.02	1.81
¹⁵⁹ Tb	0.00003	0.02	1.58
¹⁶³ Dy	0.0002	0.02	1.43
¹⁶⁵ Ho	0.00004	0.02	1.77
¹⁶⁶ Er	0.0001	0.02	1.88
¹⁶⁹ Tm	0.00005	0.02	3.11
¹⁷² Yb	0.0002	0.02	2.77
¹⁷⁵ Lu	0.00006	0.02	4.48

Table S4. Sulfur isotope composition of sulfides from the Longshan Sb-Au deposit, South China.

Sample No.	Mining district	Mineralization stage	Mine level	Orebody No.	Mineral assemblage	Arsenopyrite $\delta^{34}\text{S}$ (‰)	Pyrite $\delta^{34}\text{S}$ (‰)
LS-11	LS	Stage-3	430	1	Auriferous disseminated arsenopyrite	0.2	
LS-52	LS	Stage-3	430	1	Auriferous disseminated arsenopyrite	-0.8	
LS-53	LS	Stage-3	430	1	Auriferous disseminated arsenopyrite + stibnite	-1.8	
LS-57	LS	Stage-4	720	7	Auriferous disseminated arsenopyrite	2.9	
LS-58	LS	Stage-4	720	7	Auriferous disseminated arsenopyrite	3.2	
LS-60	LS	Stage-4	720	7	Auriferous disseminated arsenopyrite	2.7	
XJS-94	XJS	Stage-3	298	4	Auriferous pyrite + stibnite		1.6