Appendix Table 1. Mineral paragenesis in the Nayongzhi Zn-Pb deposit

Period	Diagenetic	Hydrothermal			Oxidized
Stage		Sulfide-(quartz-carbonates)		Quartz-carbonates-barite	
Mineral assemblage	Pyrite + quartz + dolomite	**Sphalerite** + pyrite + galena + quartz + calcite/dolomite	**Sphalerite + galena** + pyrite quartz + calcite/dolomite	Quartz + calcite/dolomite + barite	Oxidized Leached
Phase		I	II	III	
Pyrite					
Sphalerite					
Galena					
Quartz					
Calcite					
Dolomite					
Barite					
Limonite					
Cerussite					
Smithsonite					
Hemimorphite					

Appendix Table 2. In situ Pb isotopic compositions of galena in the Nayongzhi deposit

Spot	Stage	$^{206}Pb/^{204}Pb$	1s	$^{207}Pb/^{204}Pb$	1s	$^{208}Pb/^{204}Pb$	1s	μ	$^{208}Pb/^{206}Pb$	1s	$^{207}Pb/^{206}Pb$	1s
K-2-01	Galena-I	17.830	0.002	15.654	0.003	37.934	0.007	9.65	2.1274	0.0001	0.87786	0.00003
K-2-02	Galena-I	17.833	0.003	15.656	0.003	37.949	0.008	9.65	2.1278	0.0001	0.87792	0.00004
K-2-03	Galena-I	17.829	0.002	15.654	0.003	37.935	0.007	9.65	2.1275	0.0001	0.87795	0.00003
K-2-04	Galena-I	17.828	0.002	15.648	0.003	37.922	0.007	9.64	2.1270	0.0001	0.87774	0.00003
K-2-05	Galena-I	17.831	0.003	15.655	0.003	37.941	0.009	9.65	2.1277	0.0002	0.87794	0.00004
K-2-06	Galena-I	17.828	0.002	15.649	0.002	37.926	0.007	9.64	2.1274	0.0001	0.87780	0.00003
K-2-07	Galena-I	17.834	0.003	15.657	0.003	37.946	0.008	9.65	2.1278	0.0001	0.87793	0.00004
K-2-08	Galena-I	17.838	0.003	15.661	0.003	37.958	0.009	9.66	2.1279	0.0001	0.87793	0.00004
K-2-09	Galena-I	17.837	0.003	15.663	0.003	37.968	0.009	9.67	2.1284	0.0001	0.87809	0.00004
K-2-10	Galena-I	17.828	0.003	15.654	0.003	37.939	0.008	9.65	2.1279	0.0001	0.87803	0.00004
K-2-11	Galena-I	17.835	0.003	15.661	0.003	37.959	0.008	9.66	2.1282	0.0001	0.87803	0.00004
K-2-12	Galena-I	17.839	0.003	15.664	0.003	37.963	0.008	9.67	2.1279	0.0001	0.87801	0.00004
K-2-13	Galena-I	17.833	0.003	15.658	0.003	37.952	0.009	9.66	2.1281	0.0002	0.87802	0.00004
K-2-14	Galena-I	17.835	0.003	15.659	0.003	37.953	0.008	9.66	2.1278	0.0001	0.87796	0.00003
K-2-15	Galena-I	17.841	0.003	15.666	0.003	37.971	0.009	9.67	2.1281	0.0002	0.87806	0.00004
K-2-16	Galena-I	17.832	0.003	15.657	0.004	37.951	0.01	9.65	2.1279	0.0001	0.87801	0.00004
HA1-5-06	Galena-I	17.838	0.002	15.656	0.002	37.955	0.006	9.65	2.1277	0.0001	0.87770	0.00003
HA1-5-07	Galena-I	17.836	0.003	15.655	0.003	37.951	0.008	9.65	2.1279	0.0001	0.87770	0.00003
HA1-5-08	Galena-I	17.832	0.002	15.652	0.003	37.943	0.007	9.64	2.1269	0.0001	0.87700	0.00003
HA1-5-09	Galena-I	17.834	0.002	15.654	0.002	37.948	0.006	9.65	2.1269	0.0001	0.87705	0.00002
HA1-5-10	Galena-I	17.833	0.002	15.652	0.003	37.944	0.007	9.64	2.1265	0.0001	0.87691	0.00002
HA1-5-11	Galena-I	17.835	0.002	15.655	0.002	37.951	0.007	9.65	2.1263	0.0001	0.87656	0.00002
HA1-5-12	Galena-I	17.838	0.002	15.655	0.002	37.954	0.006	9.65	2.1277	0.0001	0.87761	0.00002
HA1-5-13	Galena-I	17.838	0.003	15.655	0.003	37.950	0.008	9.65	2.1275	0.0001	0.87760	0.00003
HA1-5-14	Galena-I	17.835	0.002	15.655	0.003	37.952	0.007	9.65	2.1280	0.0001	0.87783	0.00003
HA1-5-15	Galena-I	17.830	0.002	15.653	0.003	37.940	0.007	9.65	2.1278	0.0001	0.87781	0.00003
HA1-5-16	Galena-I	17.831	0.002	15.651	0.002	37.937	0.006	9.64	2.1277	0.0001	0.87775	0.00002
H2A5-4-01	Galena-II	17.837	0.002	15.659	0.003	37.952	0.007	9.66	2.1277	0.0001	0.87786	0.00003
H2A5-4-02	Galena-II	17.840	0.003	15.663	0.003	37.963	0.009	9.66	2.1280	0.0001	0.87795	0.00004
H2A5-4-03	Galena-II	17.840	0.002	15.662	0.003	37.964	0.007	9.66	2.1280	0.0001	0.87795	0.00003
H2A5-4-04	Galena-II	17.846	0.002	15.665	0.002	37.971	0.007	9.67	2.1277	0.0001	0.87779	0.00003
H2A5-4-05	Galena-II	17.846	0.003	15.661	0.003	37.960	0.008	9.66	2.1271	0.0001	0.87747	0.00003
H2A5-4-06	Galena-II	17.842	0.002	15.655	0.003	37.945	0.007	9.65	2.1269	0.0001	0.87747	0.00003
H2A5-4-07	Galena-II	17.842	0.002	15.661	0.002	37.954	0.007	9.66	2.1272	0.0001	0.87776	0.00003
H2A5-4-08	Galena-II	17.843	0.002	15.662	0.002	37.957	0.007	9.66	2.1275	0.0001	0.87781	0.00003
H2A5-4-09	Galena-II	17.848	0.002	15.658	0.002	37.955	0.007	9.65	2.1265	0.0001	0.87732	0.00003
H2A5-4-10	Galena-II	17.846	0.002	15.656	0.002	37.947	0.007	9.65	2.1263	0.0001	0.87729	0.00003
H2A5-4-11	Galena-II	17.849	0.003	15.659	0.003	37.960	0.007	9.66	2.1267	0.0001	0.87736	0.00003
H2A5-4-12	Galena-II	17.848	0.003	15.66	0.003	37.960	0.007	9.66	2.1269	0.0001	0.87744	0.00003
H2A5-4-13	Galena-II	17.848	0.003	15.66	0.003	37.957	0.007	9.66	2.1267	0.0001	0.87742	0.00003
H2A5-4-14	Galena-II	17.846	0.002	15.657	0.003	37.951	0.007	9.65	2.1266	0.0001	0.87735	0.00003

H2A5-4-15	Galena-II	17.853	0.002	15.665	0.003	37.971	0.007	9.67	2.1270	0.0001	0.87745	0.00003
H2A5-4-16	Galena-II	17.851	0.002	15.661	0.003	37.965	0.007	9.66	2.1268	0.0001	0.87738	0.00003
HA1-5-01	Galena-II	17.860	0.002	15.664	0.003	37.991	0.007	9.66	2.1271	0.0001	0.87745	0.00003
HA1-5-02	Galena-II	17.857	0.002	15.662	0.002	37.979	0.006	9.66	2.1276	0.0001	0.87763	0.00003
HA1-5-03	Galena-II	17.856	0.002	15.659	0.002	37.974	0.005	9.65	2.1276	0.0001	0.87768	0.00003
HA1-5-04	Galena-II	17.870	0.002	15.665	0.002	37.998	0.006	9.66	2.1277	0.0001	0.87771	0.00003
HA1-5-05	Galena-II	17.835	0.003	15.65	0.003	37.937	0.008	9.64	2.1276	0.0001	0.87767	0.00003
1390-JP-12-01	Galena-II	17.851	0.002	15.662	0.002	37.970	0.006	9.66	2.1269	0.0001	0.87734	0.00003
1390-JP-12-02	Galena-II	17.848	0.003	15.659	0.003	37.962	0.008	9.66	2.1269	0.0001	0.87739	0.00003
1390-JP-12-03	Galena-II	17.843	0.003	15.657	0.003	37.951	0.007	9.65	2.1268	0.0001	0.87742	0.00003
1390-JP-12-04	Galena-II	17.840	0.002	15.651	0.002	37.934	0.006	9.64	2.1263	0.0001	0.87727	0.00003
1390-JP-12-05	Galena-II	17.853	0.003	15.662	0.003	37.968	0.008	9.66	2.1267	0.0001	0.87730	0.00003
1390-JP-12-06	Galena-II	17.844	0.003	15.660	0.003	37.959	0.008	9.66	2.1272	0.0001	0.87763	0.00003
1390-JP-12-07	Galena-II	17.851	0.003	15.662	0.003	37.968	0.007	9.66	2.1268	0.0001	0.87735	0.00003
1390-JP-12-08	Galena-II	17.853	0.003	15.662	0.003	37.974	0.007	9.66	2.1270	0.0001	0.87726	0.00003
1390-JP-12-09	Galena-II	17.848	0.003	15.66	0.003	37.961	0.008	9.66	2.1269	0.0001	0.87743	0.00004
1390-JP-12-10	Galena-II	17.857	0.003	15.666	0.003	37.979	0.007	9.67	2.1269	0.0001	0.87733	0.00003
1390-JP-12-11	Galena-II	17.846	0.002	15.66	0.002	37.960	0.007	9.66	2.1271	0.0001	0.87752	0.00003
1390-JP-12-12	Galena-II	17.837	0.002	15.659	0.003	37.951	0.007	9.66	2.1277	0.0001	0.87790	0.00003
1390-JP-12-13	Galena-II	17.838	0.003	15.661	0.003	37.955	0.008	9.66	2.1277	0.0001	0.87790	0.00003
1390-JP-12-14	Galena-II	17.860	0.002	15.662	0.003	37.976	0.007	9.66	2.1263	0.0001	0.87693	0.00003
1390-JP-12-15	Galena-II	17.849	0.002	15.663	0.003	37.968	0.007	9.66	2.1271	0.0001	0.87749	0.00003
1390-JP-12-16	Galena-II	17.857	0.003	15.662	0.003	37.975	0.008	9.66	2.1266	0.0001	0.87705	0.00003

$\mu = {}^{238}U/{}^{204}Pb$

Appendix Table 3. A comparison between the Nayongzhi and the Huize, Tianqiao, and typical MVT deposits

Characteristics	Tianqiao	Huize	MVT	Nayongzhi
Grade	Pb + Zn: 6.92-20.51 wt. %, Zn/(Zn + Pb): 0.75±	Pb + Zn: 25-35 wt. %, Zn/(Zn + Pb): 0.9±	Pb + Zn: average < 10 wt. %, Zn/(Zn + Pb): 0.8±	Pb + Zn: average 8-10 wt. %, Zn/(Zn + Pb): 0.9±
Tonnage	Pb + Zn total reserve: > 0.2 Mt	Pb + Zn reserve: single ore body ~ 1 Mt, total > 5 Mt	Pb + Zn reserves: single ore body < 1 Mt	Pb + Zn reserves: single ore body < 0.5 Mt, total > 1 Mt
Acreage	The SYG province covers 170, 000 km^2	The SYG province covers 170, 000 km^2	Hundreds square kilometers	The Wuzhishan area covers 20 km^2
Host rocks	Late Devonian and early Carboniferous coarse-grained dolostone	Early Carboniferous coarse-grained dolostone	Cambrian to Carboniferous carbonate rocks	Late Ediacaran and early Cambrian dolostone
Depth of Mineralization	>400 m	>2000 m	<1500 m	<400 m
Tectonic setting	Western Yangtze Block, controlled by the NW fold-thrust fault	Western Yangtze Block, controlled by NE fold-thrust fault	Generally related to extensional basin	Northern Youjiang Basin, controlled by the Wuzhishan anticline
Relation with magmatic activity	Spatially associated with late Permian Emeishan basalts and Mesozoic mafic (diabase) dykes	Spatially associated with late Permian Emeishan basalts	Generally no genetic connection with magmatic activity	No genetic relationship with magmatic activity
Ore-controlled factors	Controlled by thrust fault-fold structure and lithology	Controlled by thrust fault-fold structure and lithology	Mainly controlled by structure and lithology	Mainly controlled by structure and lithology
Age	192 Ma	222-226 Ma	From Proterozoic to Cretaceous	Early Yanshanian
Ore texture and structure	Mainly exhibiting massive structures, and fine-, medium- and coarse-grained textures	Mainly exhibiting massive structures, and fine-, medium- and coarse-grained textures	Exhibiting disseminated, fine granular, branched, colloidal and massive structures and colloidal, skeleton coarse-crystalline textures	Veined, disseminated, and brecciated structures and colloidal, cataclastic, granular textures
Mineral compositions	Sphalerite, galena, pyrite, calcite and dolomite	Sphalerite, galena, pyrite and calcite	Sphalerite, galena, pyrite, barite, fluorite, calcite and dolomite, etc.	Sphalerite, galena, pyrite, calcite, dolomite, quartz and barite
Fluid inclusions	<10 wt. % NaCl equiv.; Cl^--Na^+-Ca^{2+}-F^--SO_4^{2-}; 150-280°C	<10 wt. % NaCl equiv.; Cl^--Na^+-Ca^{2+}-F^--SO_4^{2-}; 150-300°C	10-30wt. % NaCl equiv.; Cl^--Na^+-Ca^{2+}-K^+-Mg^{2+}; 50-200°C	10-15 wt. % NaCl equiv.; Cl^--Na^+-Ca^{2+}-K^+-Mg^{2+}; 113-232°C
Associated metals	Ag, Cu, Ge, Ga, Cd and In	Ag, Cu, Ge, Ga, Cd and In	Ag	Ag
S isotopes	+8- +15‰	+11-+17‰	+10-+25‰	+11-+33‰
Pb isotopes	Normal Pb isotopes	Normal Pb isotopes	Complicated Pb isotope ratios and regional zonation	Uniform Pb isotope ratios
References	Zhou et al. 2013a, 2014a	Li et al. 2007; Huang et al. 2010	Leach et al. 2005, 2010	Zhu et al. 2016; Jin et al. 2016; This paper