

Supplementary Materials: Chemical Environment of Unusually Ge- and Pb-Rich Willemite, Tres Marias Mine, Mexico

Bernhardt Saini-Eidukat, Frank Melcher, Jörg Göttlicher and Ralph Steininger

Table S1. Compositions of willemite from the Tres Marias deposit.

Analysis	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SiO ₂	27.61	26.56	26.80	27.56	27.37	26.85	27.67	27.34	27.13	26.89	27.70	27.13	27.13	27.15	27.28	26.99	27.22	27.38	27.30
P ₂ O ₅						0.330		0.241	0.764								0.113	0.109	0.114
V ₂ O ₃					0.114	0.063	0.066	0.134											
FeO		0.081					0.049												
ZnO	71.60	69.59	69.38	70.83	70.26	71.47	72.06	71.31	71.42	70.62	72.25	70.75	71.51	70.92	70.35	70.77	71.44	71.16	70.60
GeO ₂		0.112	0.087			0.064				0.062		0.077		0.040	0.200	0.195		0.057	0.115
As ₂ O ₃		0.633	0.714			0.494		0.268		0.714		0.219	0.803	0.212	0.092		0.108		0.128
PbO	0.119	1.536	1.448	0.132	0.500	0.386		0.680	0.537	1.018		1.135	0.306	0.878	1.713	1.228	0.730	0.974	1.374
Total	99.32	98.51	98.43	98.52	98.25	99.65	99.84	99.97	99.85	99.31	99.95	99.32	99.75	99.20	99.64	99.18	99.62	99.68	99.63
Si	1.0249	1.0079	1.0142	1.0292	1.0288	0.9978	1.0194	1.0113	1.0006	1.0069	1.0203	1.0143	1.0066	1.0147	1.0187	1.0118	1.0129	1.0186	1.0185
P						0.0104		0.0076	0.0238								0.0036	0.0034	0.0036
V					0.0034	0.0019	0.0019	0.0040											
Fe		0.0026					0.0015												
Zn	1.9622	1.9498	1.9384	1.9526	1.9495	1.9610	1.9604	1.9478	1.9450	1.9522	1.9650	1.9526	1.9591	1.9571	1.9395	1.9590	1.9628	1.9543	1.9444
Ge		0.0024	0.0019			0.0014				0.0013		0.0017		0.0009	0.0043	0.0042		0.0012	0.0025
As		0.0146	0.0164			0.0112		0.0060		0.0162		0.0050	0.0181	0.0048	0.0021		0.0024		0.0029
Pb	0.0012	0.0157	0.0148	0.0013	0.0051	0.0039		0.0068	0.0053	0.0103		0.0114	0.0031	0.0088	0.0172	0.0124	0.0073	0.0098	0.0138
Figure	1	1	1	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Analysis	20	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
SiO ₂	27.17	26.86	26.92	26.66	26.52	27.07	27.11	26.49	27.29	27.31	26.55	27.19	27.13	26.80	27.02	26.62	27.08	26.30	
P ₂ O ₅		0.548	0.399						0.117	0.116		0.145	0.145	0.201				0.275	
V ₂ O ₃		0.065																	
FeO	0.068											0.109						0.158	
ZnO	70.70	69.76	71.46	71.91	71.07	70.44	72.16	72.06	69.60	70.06	71.34	68.92	69.76	70.06	69.53	70.84	71.88	68.61	
GeO ₂	0.131	0.029	0.168	0.402	0.513	0.155	0.140	0.543	0.160	0.085	0.436	0.164	0.101	0.072	0.173	0.579	0.055		
As ₂ O ₃		0.365			0.142	0.058				0.252	0.086	0.088	0.205	0.274		0.062	0.571	0.275	
PbO	1.309	0.767	0.072	0.255	1.107	1.385	0.107	0.112	1.830	1.514	0.321	2.148	1.458	1.009	1.845	1.151	0.103	1.807	
Total	99.38	98.40	99.02	99.23	99.35	99.11	99.52	99.20	99.00	99.33	98.74	98.77	98.80	98.41	98.56	99.25	99.69	97.43	
Si	1.0169	1.0057	1.0021	0.9959	0.9954	1.0153	1.0076	0.9909	1.0239	1.0211	0.9964	1.0250	1.0197	1.0097	1.0186	1.0007	1.0051	1.0071	
P		0.0174	0.0126						0.0037	0.0037		0.0046	0.0046	0.0064				0.0089	
V		0.0020																	

Table S1. *Cont.*

Analysis	20	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Fe	0.0021											0.0034						0.0051
Zn	1.9540	1.9282	1.9641	1.9833	1.9696	1.9503	1.9803	1.9898	1.9280	1.9341	1.9770	1.9183	1.9359	1.9489	1.9357	1.9663	1.9697	1.9398
Ge	0.0028	0.0006	0.0036	0.0086	0.0111	0.0033	0.0030	0.0117	0.0035	0.0018	0.0094	0.0036	0.0022	0.0015	0.0038	0.0125	0.0012	
As		0.0083			0.0032	0.0013				0.0057	0.0020	0.0020	0.0047	0.0063		0.0014	0.0129	0.0064
Pb	0.0132	0.0077	0.0007	0.0026	0.0112	0.0140	0.0011	0.0011	0.0185	0.0152	0.0032	0.0218	0.0147	0.0102	0.0187	0.0116	0.0010	0.0186
Figure	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	none

Oxides in wt %; recalculated on basis of 7 atoms. Open fields: below detection limits.



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