minerals

MDPI

Supplementary Materials

Au and Te Minerals in Seafloor Massive Sulphides from Semyenov-2 Hydrothermal Field, Mid-Atlantic Ridge

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Table S1. Chemical Composition of Minerals from Semyenov-2 Hydrothermal Field (EDX data).

Chalcopyrite Chimneys															
	Bi	**Se**	**Te**	**Pb**	**Au**	**Ag**	**Ni**	**Cu**	**As**	**Sb**	**Zn**	**Fe**	**S**	**Mo**	**Sum**
Tellurobismuthite Bi_2Te_3	50.74	-	47.79	-	-	-	-	-	-	-	-	-	-	-	98.53
Tellurobismuthite Bi_2Te_3	52.21	-	47.60	-	-	-	-	-	-	-	-	-	-	-	99.81
Tellurobismuthite Bi_2Te_3	52.01	-	47.89	-	-	-	-	-	-	-	-	-	-	-	99.90
Tellurobismuthite Bi_2Te_3	51.92	-	48.01	-	-	-	-	-	-	-	-	-	-	-	99.93
Tellurobismuthite Bi_2Te_3	51.57	-	48.31	-	-	-	-	-	-	-	-	-	-	-	99.88
Tellurobismuthite Bi_2Te_3	52.34	-	48.51	-	-	-	-	-	-	-	-	-	-	-	100.85
Tellurobismuthite Bi_2Te_3	52.32	-	47.63	-	-	-	-	-	-	-	-	-	-	-	99.95
Tellurobismuthite Bi_2Te_3	50.83	-	48.72	-	-	-	-	-	-	-	-	-	-	-	99.55
Tellurobismuthite Bi_2Te_3	51.13	-	47.88	-	-	-	-	-	-	-	-	-	-	-	99.01
Tellurobismuthite Bi_2Te_3	51.82	-	47.72	-	-	-	-	-	-	-	-	-	-	-	99.54
Average	51.69	-	48.00	-	-	-	-	-	-	-	-	-	-	-	
											Formula		$Bi_{1.99}Te_{3.00}$		
Calaverite $AuTe_2$	0.01	-	55.27	-	44.44	-	-	0.24	-	-	-	-	-	-	99.96
Calaverite $AuTe_2$	-	-	58.17	-	40.83	-	-	-	-	-	-	-	-	-	99.00
Calaverite $AuTe_2$	0.17	-	54.89	-	44.75	-	-	0.86	-	-	-	-	-	-	100.67
Calaverite $AuTe_2$	-	-	54.96	-	44.96	-	-	-	-	-	-	-	-	-	99.92
Calaverite $AuTe_2$	-	-	56.71	-	43.14	-	-	-	-	-	-	-	-	-	99.85

Calaverite $AuTe_2$	0.64	-	55.30	-	45.02	-	-	-	-	-	-	-	-	-	100.96
Calaverite $AuTe_2$	-	-	58.13	-	41.83	-	-	-	-	-	-	-	-	-	99.96
Calaverite $AuTe_2$		-	59.09	-	41.51	-	-	-	-	-	-	-	-	-	100.60
Average	0.27	-	56.56	-	43.31	-	-	0.55	-	-	-	-	-	-	
										Formula		$Au_{0.99}$	$Cu_{0.04}$	$Bi_{0.01}$	$Te_{2.00}$
Native gold	-	-	-	-	90.01	8.85	-	-	-	-	-	-	-	-	98.86
Native gold	-	-	-	-	87.69	10.24	-	-	-	-	-	0.95	-	-	98.88
Native gold	-	-	-	-	86.16	7.26	-	6.88	-	-	-	-	-	-	100.30
Native gold	-	-	-	-	90.31	8.87	-	-	-	-	-	-	-	-	99.18
Native gold	-	-	-	-	90.01	9.01	-	-	-	-	-	-	-	-	99.02
Native gold	-	-	-	-	90.82	7.08	-	1.10	-	-	-	-	-	-	99.00
Native gold	-	-	-	-	88.63	10.31	-	-	-	-	-	-	-	-	98.94
Native gold	-	-	-	-	89.38	9.34	-	0.30	-	-	-	-	-	-	99.02
Average	-	-	-	-	89.12	8.87	-	2.76	-	-	-	0.95	-	-	
										Formula		$Au_{0.75}$	$Cu_{0.07}$	$Fe_{0.03}$	$Ag_{0.14}$
Melonite $NiTe_2$	-	-	81.02	-	18.83	-	-	-	-	-	-	-	-	-	99.85
Melonite $NiTe_2$	-	-	81.79	-	17.99	-	-	-	-	-	-	-	-	-	99.78
Average	-	-	81.40	-	18.41	-	-	-	-	-	-	-	-	-	
											Formula		$Ni_{0.96}$	$Te_{2.00}$	

Chalcopyrite-sphalerite Chimneys															
	Bi	**Se**	**Te**	**Pb**	**Au**	**Ag**	**Ni**	**Cu**	**As**	**Sb**	**Zn**	**Fe**	**S**	**Mo**	**Sum**
Native gold	-	-	-	-	83.53	14.37	-	-	-	-	-	-	-	-	97.90
Native gold	-	-	-	-	85.46	13.22	-	-	-	-	-	-	-	-	98.68
Native gold	-	-	-	-	85.40	13.64	-	-	-	-	-	-	-	-	99.04
Native gold	-	-	-	-	85.50	13.91	-	-	-	-	-	-	-	-	99.41
Native gold	-	-	-	-	84.97	14.43	-	-	-	-	-	-	-	-	99.40
Native gold	-	-	-	-	84.57	14.46	-	-	-	-	-	-	-	-	99.03
Average	-	-	-	-	84.90	14.00	-	-	-	-	-	-	-	-	
											Formula		$Au_{0.79}Ag_{0.13}$		
Electrum	-	-	-	-	68.44	30.56	-	-	-	-	-	-	-	-	99.00
Electrum	-	-	-	-	58.75	40.89	-	-	-	-	-	-	-	-	99.64
Electrum	-	-	-	-	71.63	27.87	-	-	-	-	-	-	-	-	99.50
Electrum	-	-	-	-	63.12	37.81	-	-	-	-	-	-	-	-	100.93
Electrum	-	-	-	-	59.12	41.15	-	-	-	-	-	-	-	-	100.27
Electrum	-	-	-	-	72.02	28.12	-	-	-	-	-	-	-	-	100.14
Electrum	-	-	-	-	64.38	34.64	-	-	-	-	-	-	-	-	99.02
Electrum	-	-	-	-	70.13	29.56	-	-	-	-	-	-	-	-	99.69
Average	-	-	-	-	65.95	33.82	-	-	-	-	-	-	-	-	
											Formula		$Au_{0.56}Ag_{0.29}$		
Calaverite $AuTe_2$	-	-	54.22	-	45.54	-	-	-	-	-	-	-	-	-	99.76
Calaverite $AuTe_2$	-	-	55.34	-	43.86	-	-	-	-	-	-	-	-	-	99.20
Calaverite $AuTe_2$	-	-	53.52	-	45.91	-	-	-	-	-	-	-	-	-	99.43
Calaverite $AuTe_2$	-	-	55.99	-	44.03	-	-	-	-	-	-	-	-	-	100.02
Calaverite $AuTe_2$	-	-	53.58	-	46.45	-	-	-	-	-	-	-	-	-	100.03
Calaverite $AuTe_2$	-	-	55.47	-	44.39	-	-	-	-	-	-	-	-	-	99.86
Average	-	-	54.69	-	45.03	-	-	-	-	-	-	-	-	-	
											Formula		$Au_{1.05}Te_{2.00}$		
Hessite Ag_2Te	-	-	33.82	-	-	66.27	-	-	-	-	-	-	-	-	100.09
Hessite Ag_2Te	-	-	39.46	-	-	60.17	-	-	-	-	-	-	-	-	99.63
Hessite Ag_2Te	-	-	33.74	-	-	65.60	-	-	-	-	-	-	-	-	99.34
Hessite Ag_2Te	-	-	38.88	-	-	60.51	-	-	-	-	-	-	-	-	99.39
Hessite Ag_2Te	-	-	33.21	-	-	66.45	-	-	-	-	-	-	-	-	99.66
Hessite Ag_2Te	-	-	34.36	-	-	64.86	-	-	-	-	-	-	-	-	99.22
Hessite Ag_2Te	-	-	37.02	-	-	62.02	-	-	-	-	-	-	-	-	99.04

Hessite Ag_2Te	-	-	36.98	-	-	62.86	-	-	-	-	-	-	-	-	99.84
Hessite Ag_2Te	-	-	33.88	-	-	66.72	-	-	-	-	-	-	-	-	100.60
Hessite Ag_2Te	-	-	34.36	-	-	64.71	-	-	-	-	-	-	-	-	99.07
Hessite Ag_2Te	-	-	38.44	-	-	61.30	-	-	-	-	-	-	-	-	99.74
Hessite Ag_2Te	-	-	38.48	-	-	60.81	-	-	-	-	-	-	-	-	99.29
Hessite Ag_2Te	-	-	33.54	-	-	66.70	-	-	-	-	-	-	-	-	100.24
Average	-	-	35.86	-	-	63.77	-	-	-	-	-	-	-	-	
											Formula		$Ag_{2.09}Te_{1.00}$		
Tellurobismuthite Bi_2Te_3	51.01	-	48.99	-	-	-	-	-	-	-	-	-	-	-	100.00
Tellurobismuthite Bi_2Te_3	58.08	-	41.92	-	-	-	-	-	-	-	-	-	-	-	100.00
Average	54.54	-	45.46	-	-	-	-	-	-	-	-	-	-	-	
											Formula		$Bi_{2.22}Te_{3.00}$		
Altaite PbTe	-	-	38.12	61.67	-	-	-	-	-	-	-	-	-	-	99.79
Altaite PbTe	-	-	33.01	67.18	-	-	-	-	-	-	-	-	-	-	100.19
Altaite PbTe	-	-	38.23	61.44	-	-	-	-	-	-	-	-	-	-	99.67
Altaite PbTe	-	-	32.68	67.03	-	-	-	-	-	-	-	-	-	-	99.71
Altaite PbTe	-	-	42.94	56.22	-	-	-	-	-	-	-	-	-	-	99.16
Altaite PbTe	-	-	43.70	55.25	-	-	-	-	-	-	-	-	-	-	98.95
Average	-	-	38.11	61.46	-	-	-	-	-	-	-	-	-	-	
											Formula		$Pb_{0.99}Te_{1.00}$		
Clausthalite PbSe	-	30.76	-	69.23	-	-	-	-	-	-	-	-	-	-	99.99
Clausthalite PbSe	-	24.44	-	75.02	-	-	-	-	-	-	-	-	-	-	99.46
Average	-	27.60	-	72.12	-	-	-	-	-	-	-	-	-	-	
											Formula		$Pb_{1.02}Se_{1.00}$		
Se-galena Pb(S,Se)	-	3.31	-	84.50	-	-	-	-	-	-	-	-	11.91	-	99.72
Se-galena Pb(S,Se)	-	3.96	-	84.90	-	-	-	-	-	-	-	-	10.26	-	99.12
Se-galena Pb(S,Se)	-	4.96	-	83.98	-	-	-	-	-	-	-	-	10.25	-	99.19
Se-galena Pb(S,Se)	-	2.01	-	85.17	-	-	-	-	-	-	-	-	11.97	-	99.15
Se-galena Pb(S,Se)	-	2.67	-	85.26	-	-	-	-	-	-	-	-	11.52	-	99.45
Se-galena Pb(S,Se)	-	2.86	-	85.83	-	-	-	-	-	-	-	-	12.10	-	100.79
Se-galena Pb(S,Se)	-	4.09	-	83.99	-	-	-	-	-	-	-	-	11.04	-	99.12
Se-galena Pb(S,Se)	-	5.87	-	84.45	-	-	-	-	-	-	-	-	10.47	-	100.79
Se-galena Pb(S,Se)	-	5.51	-	84.77	-	-	-	-	-	-	-	-	10.71	-	100.99
Average	-	3.92	-	84.76	-	-	-	-	-	-	-	-	11.14	-	
											Formula		$Pb_{0.84}(S, Se)_{1.00}$		

Isocubanite-chalcopyrite-sphalerite-wurtzite-opal Massive Sulfides															
	Bi	**Se**	**Te**	**Pb**	**Au**	**Ag**	**Ni**	**Cu**	**As**	**Sb**	**Zn**	**Fe**	**S**	**Mo**	**Sum**
Native gold	0.05	-	-	-	88.08	11.92	-	-	-	-	-	-	-	0.15	100.05
Native gold	-	-	-	-	90.67	9.23	-	-	-	-	-	-	-	-	99.90
Average	0.03	-	-	-	89.38	10.58	-	-	-	-	-	-	-	0.08	
										Formula		$(Au, Bi, Mo)_{0.85}Ag_{0.10}$			
Electrum	-	-	-	-	68.80	31.03	-	-	-	-	-	-	-	-	99.83
Electrum	-	-	-	-	56.09	44.32	-	-	-	-	-	-	-	-	100.41
Electrum	-	-	-	-	60.63	40.16	-	-	-	-	-	-	-	-	100.79
Electrum	-	-	-	-	55.61	44.28	-	-	-	-	-	-	-	-	99.89
Electrum	-	-	-	-	72.09	26.80	-	-	-	-	-	-	-	-	98.89
Electrum	-	-	-	-	57.46	42.24	-	-	-	-	-	-	-	-	99.70
Electrum	-	-	-	-	59.16	39.84	-	-	-	-	-	-	-	-	99.00
Electrum	-	-	-	-	72.12	27.09	-	-	-	-	-	-	-	-	99.21
Electrum	-	-	-	-	56.92	42.52	-	-	-	-	-	-	-	-	99.44
Electrum	-	-	-	-	64.86	36.12	-	-	-	-	-	-	-	-	100.98
Electrum	-	-	-	-	61.94	37.98	-	-	-	-	-	-	-	-	99.92
Average	-	-	-	-	62.33	37.49	-	-	-	-	-	-	-	-	
											Formula		$Au_{0.52}Ag_{0.31}$		
Hessite Ag_2Te	-	-	39.08	-	-	61.28	-	-	-	-	-	-	-	-	100.36
Hessite Ag_2Te	-	-	38.61	-	-	60.43	-	-	-	-	-	-	-	-	99.04
Hessite Ag_2Te	-	-	37.20	-	-	62.79	-	-	-	-	-	-	-	-	99.99
Hessite Ag_2Te	-	-	33.75	-	-	65.75	-	-	-	-	-	-	-	-	99.50
Hessite Ag_2Te	-	-	36.11	-	-	63.81	-	-	-	-	-	-	-	-	99.92
Hessite Ag_2Te	-	-	34.19	-	-	66.12	-	-	-	-	-	-	-	-	100.31
Hessite Ag_2Te	-	-	38.76	-	-	61.64	-	-	-	-	-	-	-	-	100.40
Hessite Ag_2Te	-	-	38.92	-	-	60.54	-	-	-	-	-	-	-	-	99.46
Hessite Ag_2Te	-	-	37.39	-	-	62.76	-	-	-	-	-	-	-	-	100.15
Average	-	-	37.11	-	-	62.79	-	-	-	-	-	-	-	-	
											Formula		$Ag_{1.99}Te_{1.00}$		
Naumannite Ag_2Se	-	27.78	-	-	-	72.30	-	-	-	-	-	-	-	-	100.08
Naumannite Ag_2Se	-	27.35	-	-	-	72.22	-	-	-	-	-	-	-	-	99.57
Naumannite Ag_2Se	-	27.67	-	-	-	71.72	-	-	-	-	-	-	-	-	99.39
Naumannite Ag_2Se	-	27.91	-	-	-	72.35	-	-	-	-	-	-	-	-	100.26

Naumannite Ag_2Se	-	28.10	-	-	-	71.77	-	-	-	-	-	-	-	-	99.87
Naumannite Ag_2Se	-	27.65	-	-	-	72.29	-	-	-	-	-	-	-	-	99.94
Naumannite Ag_2Se	-	27.37	-	-	-	71.65	-	-	-	-	-	-	-	-	99.02
Naumannite Ag_2Se	-	27.35	-	-	-	72.06	-	-	-	-	-	-	-	-	99.41
Naumannite Ag_2Se	-	26.91	-	-	-	71.99	-	-	-	-	-	-	-	-	98.90
Naumannite Ag_2Se	-	28.29	-	-	-	71.35	-	-	-	-	-	-	-	-	99.64
Naumannite Ag_2Se	-	27.68	-	-	-	72.33	-	-	-	-	-	-	-	-	100.01
Naumannite Ag_2Se	-	28.22	-	-	-	71.45	-	-	-	-	-	-	-	-	99.67
Naumannite Ag_2Se	-	27.41	-	-	-	72.12	-	-	-	-	-	-	-	-	99.53
Naumannite Ag_2Se	-	27.54	-	-	-	71.89	-	-	-	-	-	-	-	-	99.43
Naumannite Ag_2Se	-	27.79	-	-	-	72.05	-	-	-	-	-	-	-	-	99.84
Naumannite Ag_2Se	-	27.66	-	-	-	71.85	-	-	-	-	-	-	-	-	99.51
Naumannite Ag_2Se	-	27.64	-	-	-	72.99	-	-	-	-	-	-	-	-	100.63
Naumannite Ag_2Se	-	27.07	-	-	-	72.24	-	-	-	-	-	-	-	-	99.31
Naumannite Ag_2Se	-	27.82	-	-	-	72.21	-	-	-	-	-	-	-	-	100.03
Naumannite Ag_2Se	-	27.23	-	-	-	72.38	-	-	-	-	-	-	-	-	99.61
Naumannite Ag_2Se	-	27.98	-	-	-	71.63	-	-	-	-	-	-	-	-	99.61
Naumannite Ag_2Se	-	28.60	-	-	-	71.90	-	-	-	-	-	-	-	-	100.50
Naumannite Ag_2Se	-	27.09	-	-	-	72.35	-	-	-	-	-	-	-	-	99.44
Naumannite Ag_2Se	-	27.73	-	-	-	72.26	-	-	-	-	-	-	-	-	99.99
Average	-	27.66	-	-	-	72.06	-	-	-	-	-	-	-	-	
											Formula		$Ag_{1.93}Se_{1.00}$		

Sphalerite-wurtzite-chalcopyrite-isocubanite Breccias with Opal Cement															
	Bi	**Se**	**Te**	**Pb**	**Au**	**Ag**	**Ni**	**Cu**	**As**	**Sb**	**Zn**	**Fe**	**S**	**Mo**	**Sum**
Tellurobismuthite Bi_2Te_3	54.69	-	44.88	-	-	-	-	-	-	-	-	-	-	-	99.57
Tellurobismuthite Bi_2Te_3	49.66	-	50.33	-	-	-	-	-	-	-	-	-	-	-	99.99
Tellurobismuthite Bi_2Te_3	55.07	-	45.24	-	-	-	-	-	-	-	-	-	-	-	100.31
Average	53.14	-	46.82	-	-	-	-	-	-	-	-	-	-	-	
											Formula		$Bi_{2.10}Te_{3.00}$		
Tetradymite Bi_2Te_2S	62.11	-	33.56	-	-	-	-	-	-	-	-	-	5.02	-	100.69
Tetradymite Bi_2Te_2S	58.93	-	36.00	-	-	-	-	-	-	-	-	-	4.12	-	99.05
Average	60.52	-	34.78	-	-	-	-	-	-	-	-	-	4.57	-	
											Formula		$Bi_{2.12}Te_{2.00}S_{0.95}$		
Hessite Ag_2Te	-	-	33.04	-	-	67.05	-	-	-	-	-	-	-	-	100.09
Hessite Ag_2Te	-	-	35.24	-	-	64.06	-	-	-	-	-	-	-	-	99.30
Hessite Ag_2Te	-	-	32.65	-	-	66.74	-	-	-	-	-	-	-	-	99.39
Hessite Ag_2Te	-	-	39.68	-	-	59.34	-	-	-	-	-	-	-	-	99.02
Hessite Ag_2Te	-	-	35.58	-	-	63.81	-	-	-	-	-	-	-	-	99.39
Hessite Ag_2Te	-	-	36.63	-	-	62.58	-	-	-	-	-	-	-	-	99.21
Hessite Ag_2Te	-	-	40.09	-	-	60.77	-	-	-	-	-	-	-	-	100.86
Hessite Ag_2Te	-	-	35.37	-	-	63.86	-	-	-	-	-	-	-	-	99.23
Average	-	-	36.04	-	-	63.53	-	-	-	-	-	-	-	-	
											Formula		$Ag_{2.07}Te_{1.00}$		
Native gold	-	-	-	-	93.89	5.38	-	-	-	-	-	-	-	0.50	99.27
Native gold	-	-	-	-	94.53	5.91	-	-	-	-	-	-	-	-	100.44
Native gold	-	-	-	-	88.75	11.25	-	-	-	-	-	-	-	-	100.00
Average	-	-	-	-	92.39	7.51	-	-	-	-	-	-	-	0.50	
											Formula		$(Au, Mo)_{0.89}Ag_{0.07}$		
Aurostibite $AuSb_2$	-	-	-	-	47.36	0.18	-	-	-	52.26	-	-	-	-	99.80
											Formula		$Au_{1.11}Sb_{2.00}$		

Altered Sulfide Breccias with Aragonite Cement															
	Bi	**Se**	**Te**	**Pb**	**Au**	**Ag**	**Ni**	**Cu**	**As**	**Sb**	**Zn**	**Fe**	**S**	**Mo**	**Sum**
Native gold	-	-	-	-	95.43	3.97	-	-	-	-	-	-	-	-	99.40
Native gold	-	-	-	-	98.27	1.04	-	-	-	-	-	-	-	-	99.31
Native gold	-	-	-	-	94.22	5.38	-	-	-	-	-	-	-	-	99.60
Native gold	-	-	-	-	98.54	1.57	-	-	-	-	-	-	-	-	100.11
Native gold	-	-	-	-	93.76	5.83	-	-	-	-	-	-	-	-	99.59
Native gold	-	-	-	-	92.69	7.30	-	-	-	-	-	-	-	-	99.99
Native gold	-	-	-	-	89.93	9.84	-	-	-	-	-	-	-	-	99.77
Native gold	-	-	-	-	98.02	2.37	-	-	-	-	-	-	-	-	100.39
Native gold	-	-	-	-	91.16	8.82	-	-	-	-	-	-	-	-	99.98
Native gold	-	-	-	-	88.51	8.92	-	-	-	-	-	-	-	-	97.43
Native gold	-	-	-	-	95.59	4.02	-	-	-	-	-	-	-	-	99.61
Native gold	-	-	-	-	92.94	6.28	-	-	-	-	-	-	-	-	99.22
Native gold	-	-	-	-	94.27	5.17	-	-	-	-	-	-	-	-	99.44
Native gold	-	-	-	-	91.91	7.70	-	-	-	-	-	-	-	-	99.61
Native gold	-	-	-	-	97.18	3.63	-	-	-	-	-	-	-	-	100.81
Native gold	-	-	-	-	93.63	5.61	-	-	-	-	-	-	-	-	99.24
Native gold	-	-	-	-	94.49	4.56	-	-	-	-	-	-	-	-	99.05
Native gold	-	-	-	-	96.59	2.56	-	-	-	-	-	-	-	-	99.15
Native gold	-	-	-	-	95.17	4.28	-	-	-	-	-	-	-	-	99.45
Native gold	-	-	-	-	91.48	8.14	-	-	-	-	-	-	-	-	99.62
Average	-	-	-	-	94.19	5.35	-	-	-	-	-	-	-	-	
											Formula		$Au_{0.91}Ag_{0.05}$		
Electrum	-	-	-	-	60.12	39.16	-	-	-	-	-	-	-	-	99.28
Electrum	-	-	-	-	62.06	38.81	-	-	-	-	-	-	-	-	100.87
Electrum	-	-	-	-	69.28	28.87	-	-	-	-	-	-	-	-	98.15
Electrum	-	-	-	-	57.71	42.19	-	-	-	-	-	-	-	-	99.90
Electrum	-	-	-	-	65.15	34.26	-	-	-	-	-	-	-	-	99.41
Electrum	-	-	-	-	70.03	29.18	-	-	-	-	-	-	-	-	99.21
Average	-	-	-	-	64.06	35.41	-	-	-	-	-	-	-	-	
											Formula		$Au_{0.64}Ag_{0.35}$		

"Fahlore" Composition in Chalcopyrite Chimneys							
	Te	**Cu**	**As**	**Sb**	**Zn**	**Fe**	**S**	**Sum**

$(Cu_{11.38}Fe_{1.15})_{12.53}(As_{2.92}Sb_{0.45}Te_{0.49})_{3.86}S_{13.00}$	4.03	46.79	14.18	3.55	-	4.14	26.97	99.66
$(Cu_{11.32}Fe_{1.24}Zn_{0.47})_{13.03}(As_{3.01}Sb_{0.54})_{3.55}S_{13.00}$	-	46.78	14.65	4.31	2.00	4.52	27.10	99.36
$(Cu_{11.24}Fe_{1.15}Zn_{0.60})_{12.99}(As_{2.93}Sb_{0.44}Te_{0.26})_{2.63}S_{13.00}$	2.13	46.18	14.18	3.50	2.53	4.17	26.95	99.64
$(Cu_{11.36}Fe_{1.19}Zn_{0.55})_{13.10}(As_{3.03}Sb_{0.51})_{3.54}S_{13.00}$	-	46.59	14.68	4.01	2.31	4.29	26.91	98.79
$(Cu_{11.45}Fe_{1.23}Zn_{0.56})_{13.24}(As_{3.00}Sb_{0.48})_{3.48}S_{13.00}$	-	47.08	14.53	3.76	2.38	4.46	26.96	99.17
$(Cu_{11.35}Fe_{1.15}Zn_{0.51})_{13.01}(As_{3.00}Sb_{0.44}Te_{0.16})_{3.60}S_{13.00}$	1.32	46.84	14.60	3.50	2.18	4.16	27.06	99.66
$(Cu_{11.29}Fe_{1.11}Zn_{0.47})_{12.87}(As_{2.83}Sb_{0.53}Te_{0.18})_{3.54}S_{13.00}$	1.46	46.61	13.78	4.20	1.98	4.01	27.08	99.12
$(Cu_{11.36}Fe_{1.20}Zn_{0.49})_{13.05}(As_{2.81}Sb_{0.51}Te_{0.15})_{3.47}S_{13.00}$	1.28	46.77	13.66	3.99	2.09	4.35	27.01	99.15
$(Cu_{11.24}Fe_{1.33})_{12.57}(As_{3.01}Sb_{0.45}Te_{0.40})_{3.86}S_{13.00}$	3.31	46.40	14.65	3.57	-	4.81	27.08	99.82
$(Cu_{10.78}Fe_{1.28}Zn_{0.52})_{12.58}(As_{2.98}Sb_{0.55})_{3.53}S_{13.00}$	-	44.95	14.66	4.36	2.22	4.68	27.34	98.21
$(Cu_{11.31}Fe_{1.24})_{12.55}(As_{3.01}Sb_{0.47}Te_{0.32})_{3.80}S_{13.00}$	2.69	46.68	14.64	3.74	-	4.49	27.08	99.32
$(Cu_{11.03}Fe_{1.18}Zn_{0.52})_{12.73}(As_{2.91}Sb_{0.54})_{3.45}S_{13.00}$	-	46.08	14.33	4.32	2.23	4.34	27.39	98.69
$(Cu_{10.97}Fe_{1.13}Zn_{0.56})_{12.66}(As_{2.73}Sb_{0.54}Te_{0.44})_{3.71}S_{13.00}$	3.62	45.23	13.28	4.30	2.36	4.09	27.04	99.92
$(Cu_{11.28}Fe_{1.05}Zn_{0.28})_{12.61}(As_{2.99}Sb_{0.54})_{3.53}S_{13.00}$	-	47.02	14.68	4.29	1.20	3.85	27.34	98.38
$(Cu_{11.23}Fe_{1.20}Zn_{0.56})_{12.99}(As_{2.90}Sb_{0.49})_{3.39}S_{13.00}$	-	46.77	14.22	3.94	2.38	4.39	27.32	99.02
$(Cu_{11.56}Fe_{1.22}Zn_{0.57})_{13.35}(As_{2.96}Sb_{0.45})_{3.41}S_{13.00}$	-	47.08	14.22	3.48	2.39	4.36	26.72	98.25
$(Cu_{11.23}Fe_{1.10})_{12.33}(As_{2.94}Sb_{0.55}Te_{0.44})_{3.93}S_{13.00}$	3.66	46.01	14.22	4.29	-	3.96	26.88	99.02
$(Cu_{11.24}Fe_{1.31}Zn_{0.56})_{13.11}(As_{2.91}Sb_{0.54})_{3.45}S_{13.00}$	-	46.42	14.17	4.27	2.39	4.75	27.08	99.08
$(Cu_{11.41}Zn_{0.59})_{12.00}(Sb_{3.94}As_{0.44})_{4.38}S_{13.00}$	-	42.48	1.94	28.12	2.26	-	24.42	99.22
$(Cu_{11.09}Zn_{0.62})_{11.71}(Sb_{3.83}As_{0.40}Te_{0.16})_{4.39}S_{13.00}$	1.21	41.66	1.77	27.54	2.41	-	24.63	99.22
$(Cu_{11.61}Zn_{0.32})_{11.93}(Sb_{3.93}As_{0.36}Te_{0.07})_{4.36}S_{13.00}$	0.52	43.65	1.58	28.30	1.25	-	24.65	99.95
$(Cu_{11.51}Zn_{0.05})_{11.56}(Sb_{4.00}As_{0.22}Te_{0.16})_{4.38}S_{13.00}$	1.19	43.15	0.96	28.76	0.20	-	24.59	98.85
$(Cu_{11.50}Zn_{0.49})_{11.99}(Sb_{4.11}As_{0.47}Te_{0.01})_{4.59}S_{13.00}$	0.01	42.31	2.06	28.98	1.86	-	24.14	99.36
$(Cu_{11.31}Zn_{1.23})_{12.54}(Sb_{3.90}As_{0.54})_{4.44}S_{13.00}$	-	41.72	2.36	27.56	4.67	-	24.20	100.51
$(Cu_{10.03}Zn_{1.93})_{11.96}(Sb_{4.13}As_{0.38})_{4.51}S_{13.00}$	-	36.95	1.67	29.16	7.32	-	24.17	99.27
$(Cu_{11.33}Zn_{1.26})_{12.59}(Sb_{3.92}As_{0.39}Te_{0.04})_{4.35}S_{13.00}$	0.31	41.69	1.69	27.64	4.78	-	24.13	100.24
$(Cu_{10.43}Zn_{2.08})_{12.51}(Sb_{3.87}As_{0.22})_{4.09}S_{13.00}$	-	39.06	0.98	27.76	8.02	-	24.56	100.38
$(Cu_{11.29}Zn_{0.51})_{11.80}(Sb_{4.07}As_{0.55}Te_{0.04})_{4.66}S_{13.00}$	0.29	41.95	2.39	29.01	1.95	-	24.38	99.97
$(Cu_{11.21}Zn_{0.23})_{11.44}(Sb_{4.06}As_{0.38})_{4.44}S_{13.00}$	-	42.04	1.68	29.15	0.89	-	24.59	98.35
$(Cu_{10.76}Zn_{1.78})_{12.54}(Sb_{4.00}As_{0.32})_{4.32}S_{13.00}$	-	39.83	1.41	28.33	6.78	-	24.27	100.62

"Fahlore" Composition in Chalcopyrite-Sphalerite Chimneys								
	Te	**Cu**	**As**	**Sb**	**Zn**	**Fe**	**S**	**Sum**
$(Cu_{11.22}Zn_{0.64}Fe_{0.63})_{12.49}(Sb_{1.44}Te_{0.58}As_{0.08})_{2.10}S_{13.00}$	5.06	48.42	0.41	11.94	2.84	2.40	28.30	99.37
$(Cu_{11.35}Zn_{0.63}Fe_{0.59})_{12.57}(Sb_{1.42}Te_{0.53}As_{0.11})_{2.06}S_{13.00}$	4.56	48.87	0.57	11.73	2.79	2.25	28.25	99.02
$(Cu_{11.09}Fe_{0.59}Zn_{0.59})_{12.27}(Sb_{1.36}Te_{0.62}As_{0.09})_{2.07}S_{13.00}$	5.42	48.06	0.48	11.30	2.64	2.24	28.42	98.56
$(Cu_{11.06}Fe_{0.62}Zn_{0.56})_{12.24}(Sb_{1.54}Te_{0.62}As_{0.05})_{2.21}S_{13.00}$	5.41	47.76	0.27	12.76	2.49	2.34	28.33	99.36
$(Cu_{11.31}Fe_{0.71}Zn_{0.57})_{12.59}(Sb_{1.61}Te_{0.52})_{2.13}S_{13.00}$	4.52	48.58	0.01	13.22	2.54	2.69	28.18	99.74
$(Cu_{11.29}Fe_{0.75}Zn_{0.64})_{12.68}(Sb_{1.50}Te_{0.51}As_{0.10})_{2.11}S_{13.00}$	4.38	48.18	0.49	12.37	2.82	2.83	28.17	99.24
$(Cu_{11.40}Fe_{0.75}Zn_{0.58})_{12.73}(Sb_{1.58}Te_{0.25}As_{0.08})_{1.91}S_{13.00}$	2.18	49.05	0.39	13.04	2.56	2.82	28.21	98.25
$(Cu_{11.37}Fe_{0.60}Zn_{0.59})_{12.56}(Sb_{1.37}Te_{0.63}As_{0.13})_{2.13}S_{13.00}$	5.42	48.99	0.68	11.33	2.63	2.26	28.26	99.57
$(Cu_{11.40}Fe_{0.72}Zn_{0.57})_{12.69}(Sb_{1.48}Te_{0.56}As_{0.04})_{2.08}S_{13.00}$	4.88	49.48	0.20	12.31	2.53	2.74	28.46	100.60
$(Cu_{11.10}Fe_{0.63}Zn_{0.55})_{12.28}(Sb_{1.57}Te_{0.62}As_{0.01})_{2.20}S_{13.00}$	5.44	48.30	0.05	13.08	2.48	2.41	28.54	100.30
$(Cu_{11.05}Fe_{0.65}Zn_{0.63})_{12.33}(Sb_{1.53}Te_{0.41}As_{0.13})_{2.07}S_{13.00}$	3.54	47.82	0.66	12.70	2.80	2.49	28.38	98.39
$(Cu_{11.46}Fe_{0.77}Zn_{0.56})_{12.79}(Sb_{1.38}Te_{0.59}As_{0.04})_{2.01}S_{13.00}$	5.13	49.32	0.22	11.39	2.48	2.92	28.22	99.68