

APPLICATION NOTE

AMIS 0559 Gold Ore - Greenstone Belt

SUMMARY

The application note summarizes the digestion of AMIS 0559, a Gold Ore Certified Reference Material from the Greenstone Belt using ColdBlock™ Digestion Pro Series Technology.

Instrument:	Equipment: ColdBlock CBM sample digester, chiller, HF compatible liners, ICP-MS & ICP-OES
Published:	January 2023
Digestion Time:	30 Minutes
Acid Used:	Aqua Regia, HF & H ₃ BO ₃
Average ColdBlock Recovery vs. CRM:	<ul style="list-style-type: none">■ 101% Arsenic■ 101% Chromium■ 97% Tellurium

METHODOLOGY

1. Chiller temperature was set to -5°C
2. 0.25g of each sample was weighed and placed into a ColdBlock™ Digestion vessel
3. 20 mL of Aqua Regia + 3 mL HF
4. Sample was digested at 80% power for 20 minutes
5. 20mL of 4%_{v/v} Boric acid was added
6. Samples were digested again at 80% power for 10 minutes
7. Samples were cooled and bulked to 50mL using 2% HNO₃ + 0.5% HCl_{v/v}

DISCUSSION

- The addition of Boric acid will help re-solubilize any insoluble fluorides and will help neutralize any remaining HF in solution.
- If Silver precipitates out of solution as AgCl, bulk up with >20% HCl_{v/v}
- If the Sulfide content of your sample is >10 wt.% - reverse the ratios of Aqua Regia and use 1:3, HCl:HNO₃ - always add the Nitric acid first (reddish brown NO₂ fumes might form)



AMIS 0559 after bulk-up

Greenstone, South Africa. Greenstone belts are zones of variably metamorphosed mafic to ultramafic volcanic sequences with associate sedimentary rocks that occur within Archaean and Proterozoic cratons between granite and gneiss bodies. Greenstone belts are primarily formed of volcanic rocks, dominated by basalt, with minor sedimentary rocks inter-leaving the volcanic formations. amis.co.za

AMIS0559; Gold Ore, Greenstone Belt; AMIS Matrix Reference Materials; A division of Torre Analytical Services; A part of Torre Industries; Gauteng, South Africa

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Results

AMIS 0559 - Gold Ore - Greenstone Belt										
Method:	.25g	20mL Aqua Regia + 3 mL HF digested at 80% for 20 minutes, add 20mL of 4% Boric Acid - and digest again at 80% for another 10 minutes								
Element	AMIS Certified 4-acid Value (ppm)	95% Confidence Limits		Sample A	Sample B	Sample C	Average (ppm)	Stdev	% RSD	% Recovery vs 4-acid value
		Low	High							
Ag	0.625	0.425	0.825	0.727	0.729	0.724	0.7	0.00	0.30%	116%
Al	77120	73670	80570	78593	75956	75303	76617.5	1422.22	1.90%	99%
As	4740	4212	5268	4743	4846	4791	4793.4	42.07	0.90%	101%
Ba	434	393	475	472	467	466	468.3	2.63	0.60%	108%
Be	1	0.87	1.13	1.02	0.92	1.06	1	0.06	5.90%	100%
Bi	0.2	0.14	0.26	0.2	0.3	0.2	0.2	0.05	20.20%	117%
Ca	11660	11659.94	11660.06	11917	11590	11283	11596.7	258.71	2.20%	99%
Cd	0.2	0.16	0.24	0.24	0.22	0.22	0.2	0.01	4.20%	113%
Ce	45	38	52	46	46	45	45.9	0.53	1.10%	102%
Co	43	40	46	43	42	41	41.8	0.56	1.30%	97%
Cr	888	729	1047	897	893	895	895.3	1.63	0.20%	101%
Cs	5	4	6	5.3	5.2	5.2	5.2	0.05	0.90%	105%
Cu	64	53	75	67.1	64.3	62.3	64.5	1.97	3.10%	101%
Dy	2	1	3	1.99	2.01	1.88	2	0.06	2.90%	98%
Er	1	0.6	1.4	1.35	1.08	1.11	1.2	0.12	10.20%	118%
Eu	1	0.93	1.07	0.96	0.95	0.91	0.9	0.02	2.20%	94%
Fe	79070	74430	83710	77544	79837	77320	78233.8	1137.50	1.50%	99%
Ga	19	17	21	20.04	18.94	19.16	19.4	0.47	2.40%	102%
Gd	3	2.8	3.2	2.8	2.9	2.9	2.9	0.05	1.60%	96%
Hf	3	2.9	3.1	2.7	2.6	2.6	2.6	0.05	1.80%	88%
Ho	0.5	0.4	0.6	0.42	0.45	0.45	0.4	0.01	3.20%	88%
K	33610	31760	35460	33466	31441	31845	32250.7	874.95	2.70%	96%
La	22	18	26	23.6	23.5	22.9	23.3	0.31	1.30%	106%
Li	42	35	49	41.9	40.1	39.5	40.5	1.02	2.50%	96%
Lu	0.2	0.16	0.24	0.23	0.21	0.2	0.2	0.01	5.80%	107%
*Mg	36410	33530	39290	36688	36555	36150	36464.2	228.70	0.60%	100%
Mn	1450	1285	1615	1543	1551	1560	1551.3	6.94	0.40%	107%
Na	1240	1077	1403	1373	1354	1377	1368	10.03	0.70%	110%
Nd	19	17	21	19.4	19.1	19.1	19.2	0.14	0.70%	101%

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Element	AMIS Certified 4-acid Value (ppm)	95% Confidence Limits		Sample A	Sample B	Sample C	Average (ppm)	Stdev	% RSD	% Recovery vs 4-acid value
		Low	High							
Ni	378	358	398	353.56	363.6	361.74	359.6	4.36	1.20%	95%
Pb	28	25	31	29	30	30	29.7	0.47	1.60%	106%
Pr	5	4	6	5.1	5.1	4.9	5	0.09	1.90%	101%
Rb	139	128	150	138.4	138.1	136.2	137.6	1.00	0.70%	99%
S	30000	27000	33000	30766	30361	29370	30166	586.25	1.90%	101%
Sb	17	14	20	17.7	18.4	18.1	18.1	0.29	1.60%	106%
Sc	21	18	24	22.8	21.3	21.5	21.9	0.68	3.10%	104%
Sm	4	3.8	4.2	3.8	3.7	3.9	3.8	0.08	2.10%	95%
Sn	2	1	3	1.8	1.7	1.8	1.8	0.05	2.70%	88%
Sr	56	51	61	53.2	53	52.4	52.9	0.33	0.60%	94%
Tb	0.4	0.36	0.44	0.4	0.5	0.4	0.4	0.05	10.90%	108%
Te	2	1.6	2.4	1.8	1.9	2.1	1.9	0.13	6.50%	97%
Th	7	5	9	8.1	7.9	8	8	0.08	1.00%	114%
Tl	1	0.9	1.1	0.95	0.96	0.98	1	0.01	1.30%	96%
Tm	0.2	0.15	0.25	0.25	0.2	0.25	0.2	0.02	10.10%	117%
U	8	7	9	8.1	8.6	8.1	8.3	0.24	2.90%	103%
V	142	130	154	158	147	145	150	5.62	3.70%	106%
Y	11	8	14	9.6	9.6	9.5	9.6	0.05	0.50%	87%
Yb	1	0.7	1.3	1.3	1.4	1.3	1.3	0.05	3.50%	133%
Zn	125	106	144	119	125	126	123	3.02	2.50%	98%
Zr	103	85	121	97	97	90	94.7	3.30	3.50%	92%

*Element is certified by fusion - Recovery (%) is calculated vs certified Fusion value