ColdBlock™ Technologies Inc.

APPLICATION NOTE

AMIS 0571
Gold Ore – Greenstone Belt

SUMMARY

The application note summarizes the digestion of AMIS 0571, a Gold Ore Certified Reference Material from the Greenstone Belt using ColdBlock™ Digestion Pro Series Technology.

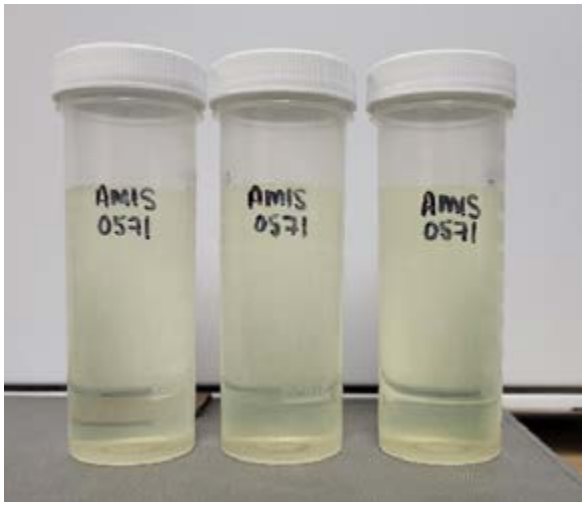
Instrument:	ColdBlock CBM sample digester, chiller, HF compatible liners, ICP-MS & ICP-OES
Published:	January 2023
Digestion Time:	30 Minutes
Acid Used:	Aqua Regia, HF & H_3BO_3
Average ColdBlock Recovery vs. CRM:	■ 98% Arsenic ■ 101% Copper ■ 106% Antimony

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% HNO_3 + 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: HNO_3 – always add the Nitric acid first (reddish brown NO_2 fumes might form)



AMIS 0571 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. The material comes from the Greenstone belt in Barberton.

amis.co.za

AMIS0571; Gold Ore, Greenstone belt; AMIS matrix Reference Materials; A Division of Torre Analytical Services; Gauteng, South Africa

AMIS 0571 Gold Ore – Greenstone Belt

Results

AMIS 0571 – 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							
Al	52800	47900	57700	53443	52848	53111	53134	243.38	0.46%	101%
As	318	268	368	317	307	315	313	4.53	1.45%	98%
Ba	94	88	100	99	99	100	99	0.73	0.73%	106%
Be	1	0.6	1.4	1	1	1	1	0.05	4.42%	107%
Bi	0.5	0.4	0.6	0.6	0.6	0.6	0.6	0.02	3.35%	123%
Ca	47400	44000	50800	48063	46531	47994	47529	706.34	1.49%	100%
Cd	0.2	0.12	0.28	0.2	0.2	0.2	0.2	0	1.83%	102%
Ce	18	16	20	20	20	20	20	0.08	0.40%	113%
Co	23	20	26	23	23	22	22	0.17	0.76%	98%
Cs	14	13	15	14	14	14	14	0.17	1.20%	101%
Cu	459	434	484	458	473	454	462	8.13	1.76%	101%
Dy	4	3.4	4.6	4	4	4	4	0.03	0.70%	102%
Er	2	1.7	2.3	2	2	2	2	0.05	2.11%	112%
Eu	1	0.7	1.3	1	1	1	1	0.02	1.66%	102%
Fe	66500	63900	69100	66350	65173	66451	65991	580.39	0.88%	99%
Ga	13	11	15	12	12	12	12	0.19	1.60%	91%
Hf	1	0.8	1.2	1.1	1.2	1.1	1	0.05	4.16%	113%
Ho	0.8	0.6	1	0.8	0.7	0.9	0.8	0.07	8.80%	102%
K	11100	10200	12000	11403	11081	11239	11241	131.4	1.17%	101%
La	8	7	9	9	9	9	9	0.08	0.92%	111%
Li	81	76	86	80	77	79	79	1.12	1.42%	97%
Lu	0.3	0.2	0.4	0.3	0.3	0.3	0.3	0.01	3.82%	109%
Mg	51800	47500	56100	53975	52860	53911	53582	511.18	0.95%	103%
Mn	1440	1386	1494	1467	1462	1491	1473	12.66	0.86%	102%
Mo	1	0.9	1.1	1	2	2	2	0.05	3.21%	147%
Na	20000	19000	21000	21268	18966	20658	20297	973.78	4.80%	101%
Nb	5	4.6	5.4	6	6	6	6	0.06	1.03%	117%
Nd	11	9	13	12	12	12	12	0.19	1.60%	107%

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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	175	146	204	184	184	188	185	1.79	0.97%	106%
Pb	191	159	223	209	208	205	207	1.8	0.87%	109%
Pr	3	2.6	3.4	2.7	2.6	2.7	3	0.05	1.81%	88%
Rb	51	49	53	52	53	52	53	0.43	0.82%	103%
S	3800	3700	3900	3807	N/A	3803	3805	2.36	0.06%	100%
Sb	6	5.6	6.4	6.3	6.4	6.4	6	0.05	0.74%	106%
Sc	23	21	25	20	20	20	20	0.05	0.23%	88%
Sm	3	2.6	3.4	3.1	3.2	3.2	3	0.05	1.49%	106%
Sn	3	2	4	2.7	2.6	2.6	3	0.05	1.79%	88%
Sr	99	95	103	98	98	98	98	0.34	0.34%	99%
Th	2	1.9	2.1	1.9	2	2.3	2	0.16	7.96%	102%
Ti	4582	4225	4939	4693	4692	4607	4664	40.1	0.86%	102%
Tl	0.3	0.2	0.4	0.3	0.3	0.3	0.3	0.02	6.65%	94%
Tm	0.3	0.3	0.3	0.2	0.4	0.3	0.3	0.08	24.28%	102%
U	0.6	0.56	0.64	0.6	0.6	0.7	0.6	0.02	3.28%	104%
V	192	174	210	198	201	201	200	1.31	0.65%	104%
W	86	74	98	75	75	76	75	0.47	0.63%	88%
Y	20	17	23	19	19	19	19	0.08	0.44%	94%
Yb	2	1.7	2.3	2.3	2.4	2.4	2	0.05	1.99%	118%
Zn	87	71	103	87	87	90	88	1.26	1.43%	101%
Zr	49	42	56	44	43	43	43	0.471	1.09%	88%

* Element certified by Combustion/LECO

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