

Copper Concentrate, CCu-1f

SUMMARY

The application note summarizes the digestion of CCu-1f, a copper concentrate certified reference material using ColdBlock Digestion Pro Series Technology.

Instrument: ColdBlock CBM Pro-Series, chiller, HF liners, ICP-OES

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Digestion Time: 30 Minutes

Acid Used: HNO₃, HCl, HF & H₃BO₃

Average ColdBlock Recovery vs. CRM:

- 103% antimony
- 98% arsenic
- 101% copper

METHODOLOGY

1. Set the chiller temperature to -5°C.
2. Weigh 0.25 g of each sample and transfer into a ColdBlock Digestion vessel
3. Add 20 mL of reverse aqua regia (add HNO₃ first, followed by HCl) and 3 mL of HF to each vessel.
4. Digest samples at 80% power for 20 minutes.
5. Add 20 mL of 4% boric acid (w/v) to each sample.
6. Digest samples again at 80% power for 10 minutes.
7. Cool the samples and adjust the volume to 50 mL with DI water

DISCUSSION

- The addition of boric acid aids in the re-solubilization of insoluble fluorides and neutralizes residual hydrofluoric acid (HF). This step is crucial for sample dissolution and minimizing analyte loss during digestion.
- Following the digestion process, the samples were green and visibly clear, indicating that the sample matrix had dissolved.



Figure 1- CCu-1f after bulking-up to 50mL

Results

CCu-1f, Copper Concentrate					
Method:	0.25g - Add 20mL reverse aqua regia + 3mL HF and digest at 80% power for 20 minutes. Add 20mL of 4% boric acid and digest again at 80% power for 10 minutes. Let cool, and adjust the volume to 50mL with DI water <small>w/v</small>				
Element	CCu-1f Certified Values	ColdBlock Average n=5	ColdBlock Stdev +/-	ColdBlock RSD	ColdBlock % Recovery vs Certified Value
Ag (µg/g)	157.0	151.9	2.4	1.6%	97%
Al (%)	0.1203	0.1281	0.004	3.4%	106%
As (%)	0.0821	0.0802	0.0007	0.9%	98%
Ca (%)	0.140	0.141	0.002	1.1%	101%
Cd (µg/g)	110.2	115.5	3.6	3.2%	105%
Co (µg/g)	304.2	314.9	8.4	2.7%	104%
Cu (%)	23.33	23.54	0.34	1.4%	101%
Fe (%)	29.50	30.04	0.30	1.0%	102%
Mg (%)	0.383	0.388	0.0006	0.2%	101%
Mn (µg/g)	82.9	83.7	1.1	1.3%	101%
Pb (%)	0.2095	0.2238	0.0045	2.0%	107%
S (%)	34.82	34.25	0.99	2.9%	98%
Sb (µg/g)	85.5	87.3	2.1	2.4%	102%
Zn (%)	4.085	4.274	0.059	1.4%	105%

The material for CZn-4 was donated by Xstrata Copper Canada Division, Kidd Metallurgical Site in Timmins, Ontario Canada
CCRMP CanmetMINING NRCan (2010). Certificate of Analysis for CZN-4, Zinc Concentrate <https://natural-resources.canada.ca/>