

APPLICATION NOTE

Nickel-Copper-Cobalt Ore, SU-1b

SUMMARY

The application note summarizes the digestion of SU-1b, a nickel-copper-cobalt ore from Ontario, Canada, using ColdBlock™ Digestion Pro Series Technology.

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

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Digestion Time: 35 Minutes

Acid Used: HNO_3 , HCl, HF & H_3BO_3

Average ColdBlock Recovery vs. CRM:

- 98% cobalt
- 101% copper
- 100% nickel

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 HNO_3 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. Add 5 mL of HCl.
8. Digest at 100% power for 5 minutes.
9. 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 yellow and visibly clear, indicating that the majority sample matrix had dissolved. A trace amount of sample material settled on the bottom of the tube overnight.



SU-1b is a nickel-copper-cobalt ore from Copper Cliff, Ontario, Canada.

Natural Resources Canada. (2009). Certificate of Analysis: SU-1b Nickel-Copper-Cobalt Ore. Canadian Certified Reference Materials Project, CanMET Mining and Mineral Sciences Laboratories. Ottawa, Ontario, Canada. Retrieved from <https://natural-resources.canada.ca/>

Results

Nickel-Copper-Cobalt Ore, SU-1b					
Method:	0.25g - Add 20mL reverse aqua regia + 3mL HF and digest at 80% power for 20 minutes. Add 20mL of 4% boric acid _{w/v} and digest again at 80% power for 10 minutes. Add 5mL HCl, and digest again for 5 minutes. Let cool, and adjust the volume to 50mL with DI water.				
Element	Certified Values	ColdBlock Average	ColdBlock +/-	ColdBlock RSD	ColdBlock Recovery vs Certified Value
Ag (ppm)	6.39	6.48	0.59	9.1%	101%
Al (%)	4.30	4.14	0.05	1.3%	96%
As (ppm)	2.49	2.50	0.27	10.6%	102%
Ca (%)	2.21	2.21	0.03	1.2%	100%
Co (%)	0.0672	0.0659	0.0002	0.3%	98%
Cu (%)	1.185	1.131	0.01	1.0%	101%
Fe (%)	25.54	25.49	0.35	1.4%	100%
Mg (%)	1.790	1.777	0.03	1.5%	99%
Mn (%)	0.0703	0.0719	0.0001	1.4%	102%
Ni (%)	1.953	1.962	0.03	1.5%	100%
Pb (ppm)	58	63	6.26	10	108%
S (%)	14.14	14.42	0.22	1.5%	102%
Zn (ppm)	235	232	4.04	1.7%	99%