

APPLICATION NOTE

GBMS304-4- Multi Element

SUMMARY

The application note summarizes the digestion of GBMS304-4, a multi-element Certified Reference Material 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 & H₃BO₃

Average ColdBlock Recovery vs. CRM:

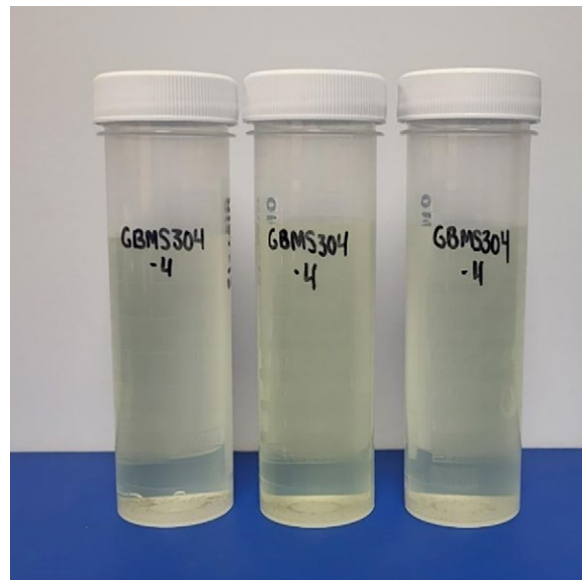
- 96% Silver
- 103% Arsenic
- 99% Sulfur

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 was added
4. Sample was digested at 80% power for 20 minutes
5. 20mL of 10%_{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 >10% 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)



Prior to homogenization and testing, this material was sourced from Cu / Au sulphidic ore
geostats.com.au

GBMS304-4; Multi-element; Geostats Pty Ltd,
Mining Industry Consultants; O'Connor, Western
Australia (April, 2004)

GBMS304-4- Multi Element

Results

| Geostats – GBMS304-4- Multi Element | | | | | | | | | | |
|-------------------------------------|---------------------------------------|--|--------|----------|----------|----------|---------------|--------|-------|--------------------------------------|
| Method: | 0.25g | 20mL reverse Aqua Regia + 3 mL HF digested at 80% for 20 minutes, add 20mL of 10% Boric Acid – and digest again at 80% for another 10 mins | | | | | | | | |
| Element | Geostats Certified 4-acid Value (ppm) | 95% Confidence Limits | | Sample A | Sample B | Sample C | Average (ppm) | Stdev | % RSD | % Recovery vs certified 4-acid value |
| | | Low | Hight | | | | | | | |
| Ag | 3.4 | 3.3 | 3.5 | 3.03 | 3.15 | 3.58 | 3.25 | 0.24 | 7.3% | 96% |
| As | 535 | 527.6 | 542.4 | 533 | 553 | 560 | 548 | 11.39 | 2.1% | 103% |
| Co | 350 | 346 | 354 | 355 | 360 | 370 | 362 | 6.14 | 1.7% | 103% |
| Cu | 9786 | 9731.8 | 9840.2 | 9806 | 9989 | 10187 | 9994 | 155.42 | 1.6% | 102% |
| Pb | 271 | 268.4 | 273.6 | 320 | 319 | 324 | 321 | 2.07 | 0.6% | 118% |
| Ni | 732 | 724.7 | 739.3 | 792 | 782 | 762 | 779 | 12.47 | 1.6% | 106% |
| S | 62700 | 62200 | 63200 | 61348 | 61222 | 62724 | 61765 | 680.22 | 1.1% | 99% |
| Zn | 149 | 147 | 151 | 146 | 147 | 149 | 147 | 1.25 | 0.8% | 99% |