ColdBlock™ Technologies Inc

APPLICATION NOTE

IARM FMnP-20 – Ferromanganese Powder

SUMMARY

The application note summarizes the digestion of IARM FMnP-20, a ferromanganese powder Certified Reference Material using ColdBlock™ Digestion Pro Series Technology.

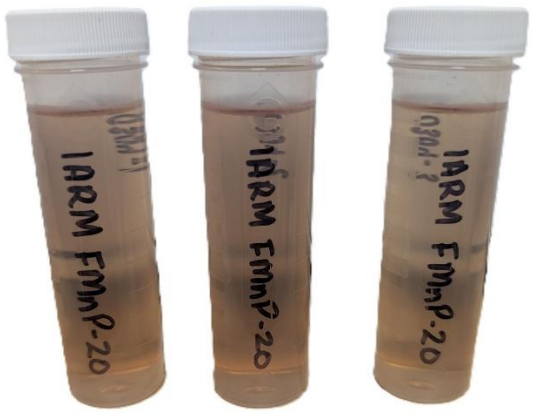
Instrument:	ColdBlock CBM sample digester, chiller, HF inserts, ICP-OES
Published:	March 2026
Digestion Time:	20 Minutes
Acid Used:	HNO_3, HF
Average ColdBlock Recovery vs. CRM:	• 99% Iron • 101% Manganese • 99% Phosphorus

METHODOLOGY

1. The chiller temperature was set to -5 °C.
2. Approximately 0.500 g of each sample was accurately weighed and transferred into a ColdBlock digestion vessel.
3. A reagent mixture of 20mL of 1:1 HNO_3 + 3mL HF was added to each vessel
4. Samples were digested at 100 % power for 5 minutes, followed by 50% power for 15 minutes.
5. Digestates were allowed to cool, then quantitatively diluted to a final volume of 50mL using a solution of 2 % $HNO_{3\ v/v}$.

DISCUSSION

- An optional addition of boric acid (20mL of 4% $_{v/v}$ H_3BO_3) can be used to complex residual fluoride ions, which stabilizes the solution and enables safe analysis on sample introduction systems that are not equipped with inert HF kits.



RESULTS

IARM FMnP-20									
Method:	0.5g	20mL 1:1 HNO_3 + 3mL HF - 100% for 5 minutes, then decrease to 50% for 15 minutes							
Element	Certified Value (wt.%)	+/-	Sample A	Sample B	Sample C	Average (ppm)	Stdev	RSD	Recovery
Co	0.019	0.002	0.020	0.020	0.020	0.020	0.00005	0.2%	103%
Cr	0.036	0.002	0.036	0.035	0.036	0.036	0.0005	1.4%	99%
Cu	0.010	0.0	0.010	0.010	0.009	0.010	0.0003	3.5%	95%
Fe	16.6	0.4	16.3	16.4	16.7	16.5	0.2	1.0%	99%
Mn	79.7	0.7	80.8	80.5	80.4	80.6	0.2	0.2%	101%
Ni	0.015	0.002	0.02	0.01	0.01	0.01	0.0005	3.4%	99%
P	0.08	0.01	0.08	0.08	0.08	0.08	0.001	1.2%	99%
Si	0.42	0.03	0.41	0.40	0.45	0.42	0.02	5.9%	100%

IARM FMnP-20; Ferromanganese Powder; Analytical Reference Materials International; Manchester, NH 03103 (Oct 2020)
LGC Standards (ARMI MBH). (2020). IARM FMnP-20 Ferromanganese Powder Certified Reference Material, Certificate of Analysis, *United States.*