ColdBlock™ Technologies Inc.

APPLICATION NOTE

Metals in Soil, ERA 540

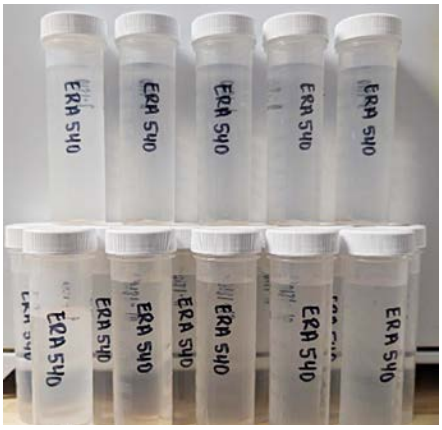
SUMMARY

The application note summarizes the digestion of ERA 540, a Metals in Soil certified reference material using ColdBlock Digestion Pro Series Technology.

Instrument:	ColdBlock CBM, chiller, ICP-OES, ICP-MS (with CRC technology)
Published:	March 2025
Digestion Time:	45 Minutes
Acid Used:	HNO_3, HCl & H_2O_2
Average ColdBlock Recovery vs. CRM:	■ 95% Antimony ■ 100% Mercury ■ 102% Silver

METHODOLOGY

1. Chiller temperature was set to -5°C
2. 0.5g of each sample was weighed and placed into a ColdBlock Digestion vessel
3. 10mL of 1:1 HNO_3 + 5mL 1:1 HCl were added, and the samples were digested at 70% power for 5 minutes
4. 10mL HNO_3 was added and digested again at 60% power for 20 minutes (repeat this step if fuming continues)
5. 3mL of 30% H_2O_2 was added slowly, and digested again at 60% for 10 minutes
6. 5mL HCl was added and digested at 60% power for 10 minutes
7. Samples were cooled and bulked to 50mL using ultrapure water



15 samples of ERA 540 after bulk up to 50mL

DISCUSSION

- This method yielded data comparable to EPA 3050B standards in just 45 minutes
- The addition of HCl in the final step of the digestion helps keep certain elements such as antimony and silver solubilized
- This method is not appropriate for standard ICP-MS instruments that are not equipped with Collision/ Reaction Cell technology

Results

ERA #540 Metals in Soil (lot:D125-540)					
Method:	0.5g - Add 10mL 1:1 HNO_3 + 5mL 1:1 HCl, digest at 70% for 5 minutes, then add 10mL HNO_3 and digest at 60% for 20 minutes (repeat this step if fuming continues) Add 3mL of 30% H_2O_2, slowly and digest again @ 60% for 10 minutes, then add 5mL HCl and digest again @ 60% for 10 minutes. Cool and bulk to 50mL with ultrapure water				
Element	*Reference Value (mg/kg) n=5	ColdBlock Average (mg/kg) n=16	ColdBlock Stdev	ColdBlock % RSD	ColdBlock % Recovery vs SW-846 3050B
Aluminum	7165	7236	549.4	7.6%	101%
Antimony	129	123	9.66	7.9%	95%
Arsenic	139	152	5.52	3.6%	110%
Barium	196	208	19.6	9.4%	106%
Beryllium	223	245	31.7	13.0%	110%
Cadmium	181	194	14.6	7.6%	107%
Calcium	4421	4323	307.5	7.1%	98%
Chromium	136	131	8.08	6.2%	96%
Cobalt	129	137	10.1	7.3%	107%
Copper	235	259	21.8	8.4%	111%
Iron	6782	7012	353.2	5.0%	103%
Lead	89	100	6.2	6.2%	113%
Magnesium	1809	2033	92.67	4.6%	112%
Manganese	245	254	20.9	8.2%	103%
Mercury	27	27	1.9	7.1%	100%
Molybdenum	94	97	5.2	5.3%	102%
Nickel	154	163	11.5	7.0%	106%
Potassium	2069	2198	158.0	7.2%	106%
Selenium	129	136	7.54	5.5%	105%
Silver	54	55	2.7	4.8%	102%
Sodium	271	290	26.6	9.2%	107%
Thallium	166	179	14.0	7.8%	108%
Vanadium	139	135	8.09	6.0%	97%
Zinc	336	340	18.7	5.5%	101%

Environmental Resource Associates. (2024). *ERA Certified Reference Material #540: Metals in Soil.* www.eraqc.com

ColdBlock™ Technologies Inc.

info@coldblock.ca
coldblock.ca/contact-us