



COLDBLOCK STRONG ACID DIGESTION METHOD A SIGNIFICANT IMPROVEMENT VS. TRADITIONAL GEOCHEMICAL FOUR-ACID DIGESTIONS

ColdBlock Method a Significantly Faster Process, While Maintaining Accuracy & Precision of Final Analytical Data

Elimination of Perchloric Represents Improvement in Laboratory Workplace Health, Safety, and Environmental Impact.

Monday, January 23, 2023 - [ColdBlock Technologies Inc.](#) (“ColdBlock”) has announced a sample digestion method using its [ColdBlock Pro Series digester](#) that effectively replaces the traditional four-acid digestion method used by laboratories worldwide, with a significantly faster digestion process that eliminates the need for dangerous perchloric acid while maintaining precision and accuracy across all typical exploration and mining sample types. ColdBlock’s Strong Acid Digestion method offers a “near total” sample digestion, equivalent to four-acid methods, but with a process that takes just 30 minutes, resulting in significant time savings and improved efficiencies compared with a traditional four-acid methods that require 2 to 3 hours. In addition, the ColdBlock method eliminates the need to use perchloric acid oxidizing reagent (most dangerous of the four acids), representing a meaningful improvement in laboratory workplace health, safety, and environmental impacts. See the data table with results on page 2.

4-acid digestions are a standard sample preparation method used in multi-element analysis of exploration samples and mining ores and concentrates. Utilizing a mixture of hydrochloric, nitric, hydrofluoric, and perchloric acids, it is the geochemical laboratory industry standard used for “near-total” digestions of most minerals and near 100% recoveries of most metal analytes of interest.

The analytical, health, safety and environmental problems with this method are recognized: 1) it takes a long time for a digestion to be completed (typically 2 to 3 hours), 2) digestions and recoveries for some samples and metals are poor, and 2) the method utilizes some of the more dangerous acids from a workplace safety and environmental standpoint (perchloric acid in particular).

ColdBlock’s patented digestion technology utilizes short-wave infrared heating and a unique cooling zone to deliver fast, accurate, repeatable digestions, with increased throughput, lower operating costs, and better workplace safety. ColdBlock digesters are being used in laboratories around the world and fit within existing lab infrastructure. This technology not only has benefits in mining, but is also used for digestion of samples being tested in specialty metals, food, environmental, agriculture and consumer goods sectors.

Duplicating Four-Acid Method using ColdBlock

ColdBlock’s method development team first looked at duplicating the industry standard 4-acid digestion method but utilizing a ColdBlock digester; confirming that with the Pro Series unit and recently developed plastic liners, laboratories can keep their typical 4-acid reagent mix and heating method (taking the sample to near dryness) but with a full process cycle of approximately **50 minutes** (full cycle time from sample weighing to final sample dilution and delivery to the instrument for analysis), a significant improvement from current 2 to 3 hour cycle times. This work demonstrated clearly that the ColdBlock technology can effectively replace Teflon test tubes and electrically heated hot blocks and/or open Teflon beaker digestions on electrically or gas heated hotplates and provide significant process time savings and improved efficiencies.

Developing a Better Method

Following this, the team worked to develop and validate a novel strong acid digestion method that further reduces cycle times while improving workplace safety. The ColdBlock Strong Acid Digestion method completely eliminates the need for perchloric acid, and also neutralizes the small amount of hydrofluoric acid used in the

procedure with boric acid. The method still achieves “near total” sample digestion, with metal analyte recoveries, precision and accuracy across typical exploration and mining sample types, equivalent to traditional 4-acid methods. The method also reduces the need to take the sample to “incipient dryness” eliminating this source of operator error and further reducing digestion time to just **30 minutes**.

Validating the ColdBlock Strong Acid Digestion Method

The ColdBlock team tested this new method on a range of certified reference materials (CRMs) from African Mineral Standards, CDN labs, Geostats, & OREAS. Results can be found in the table below. The data shows excellent comparison with certified average 4-acid digestion results for all CRMs, across all elements of interest including base metals, rare earth elements, battery metal elements like lithium, as well as radioactive elements like uranium & thorium. Measurements were taken using ICP-MS and all results were within the range of accepted values as defined on the CRM certificates.

Element	AMIS CRMs % Recoveries			CDN-LABS CRMs % Recoveries			Geostats CRMs % Recoveries		OREAS CRMs % Recoveries		
	AMIS 0566	AMIS 0559	AMIS 0571	CDN-ME-1709	CDN-ME-1805	CDN-ME-1902	GBMS 304-4	GBM 909-15	OREAS 503C	OREAS 134b	OREAS 901
Ag	100%	116%	N/A	107%	104%	93%	96%	94%	103%	95%	107%
Al	97%	99%	101%	N/A	N/A	N/A	N/A	N/A	97%	95%	99%
As	99%	101%	97%	N/A	N/A	N/A	103%	N/A	99%	105%	95%
Ba	102%	108%	106%	N/A	N/A	N/A	N/A	N/A	115%	N/A	102%
Be	N/A	100%	107%	N/A	N/A	N/A	N/A	N/A	116%	N/A	94%
Bi	98%	117%	123%	N/A	N/A	N/A	N/A	N/A	104%	N/A	97%
Ca	97%	99%	100%	N/A	N/A	N/A	N/A	N/A	102%	94%	108%
Cd	112%	113%	100%	N/A	N/A	N/A	N/A	N/A	97%	100%	N/A
Ce	105%	102%	104%	N/A	N/A	N/A	N/A	N/A	98%	N/A	95%
Co	96%	97%	98%	N/A	N/A	N/A	103%	N/A	97%	96%	100%
Cr	N/A	103%	N/A	N/A	N/A	N/A	N/A	N/A	106%	N/A	110%
Cs	N/A	105%	101%	N/A	N/A	N/A	N/A	N/A	107%	N/A	107%
Cu	99%	101%	101%	100%	98%	102%	102%	98%	97%	99%	100%
Fe	97%	99%	99%	N/A	N/A	N/A	N/A	N/A	98%	98%	98%
Ga	96%	102%	101%	N/A	N/A	N/A	N/A	N/A	96%	N/A	96%
Hf	N/A	88%	113%	N/A	N/A	N/A	N/A	N/A	96%	N/A	96%
K	97%	96%	101%	N/A	N/A	N/A	N/A	N/A	98%	N/A	101%
La	112%	106%	109%	N/A	N/A	N/A	N/A	N/A	100%	N/A	97%
Li	N/A	96%	97%	N/A	N/A	N/A	N/A	N/A	101%	N/A	97%
Lu	N/A	100%	109%	N/A	N/A	N/A	N/A	N/A	96%	N/A	99%
Mg	100%	100%	103%	N/A	N/A	N/A	N/A	N/A	102%	100%	101%
Mn	100%	107%	102%	N/A	N/A	N/A	N/A	N/A	102%	N/A	101%
Na	105%	110%	100%	N/A	N/A	N/A	N/A	N/A	86%	N/A	90%
Ni	N/A	95%	104%	N/A	N/A	N/A	106%	102%	106%	N/A	98%
Pb	98%	106%	109%	112%	100%	104%	118%	102%	98%	102%	98%
Rb	107%	96%	95%	N/A	N/A	N/A	N/A	N/A	96%	N/A	101%
Sb	106%	106%	106%	N/A	N/A	N/A	N/A	N/A	109%	98%	98%
Sc	N/A	105%	88%	N/A	N/A	N/A	N/A	N/A	106%	N/A	109%
Se	N/A	97%	N/A	N/A	N/A	N/A	N/A	N/A	92%	N/A	N/A
Sn	N/A	88%	88%	N/A	N/A	N/A	N/A	N/A	79%	N/A	87%
Sr	99%	94%	94%	N/A	N/A	N/A	N/A	N/A	96%	N/A	96%
Te	100%	97%	N/A	N/A	N/A	N/A	N/A	N/A	127%	N/A	124%
Th	99%	114%	117%	N/A	N/A	N/A	N/A	N/A	98%	N/A	100%
Tl	N/A	96%	122%	N/A	N/A	N/A	N/A	N/A	107%	N/A	107%
Tm	115%	117%	100%	N/A	N/A	N/A	N/A	N/A	99%	N/A	N/A
U	104%	103%	104%	N/A	N/A	N/A	N/A	N/A	110%	N/A	100%
V	98%	108%	91%	N/A	N/A	N/A	N/A	N/A	101%	N/A	99%
Y	98%	87%	94%	N/A	N/A	N/A	N/A	N/A	92%	N/A	96%
Yb	N/A	133%	118%	N/A	N/A	N/A	N/A	N/A	98%	N/A	98%
Zn	99%	98%	101%	103%	101%	103%	99%	100%	104%	98%	104%
Zr	N/A	92%	88%	N/A	N/A	N/A	N/A	N/A	85%	N/A	99%

The data clearly demonstrates that results using the ColdBlock Strong Acid Digestion Method can replicate traditional 4-acid digestion results. This is achieved with a significantly faster process that should result in improved laboratory efficiency, increased sample throughput per hour, and lower operational costs. As well, by removing perchloric acid, this method represents a meaningful improvement in laboratory workplace safety.

About ColdBlock Technologies

ColdBlock is disrupting the analytical laboratory technology sector with its innovative sample digestion technology. This technology utilizes focused short-wave infrared heating and a unique cooling zone to dissolve solid sample matter into solution for multi-element analysis with a significantly faster, simpler, and safer process compared with older digestion methods. ColdBlock's sample digestion system is being utilized in laboratories across several industries, saving time and money by increasing sample throughput capacity and significantly reducing turnaround times, while providing accurate and reliable results. ColdBlock Technologies Inc. is a privately owned company based in Ontario, Canada.

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