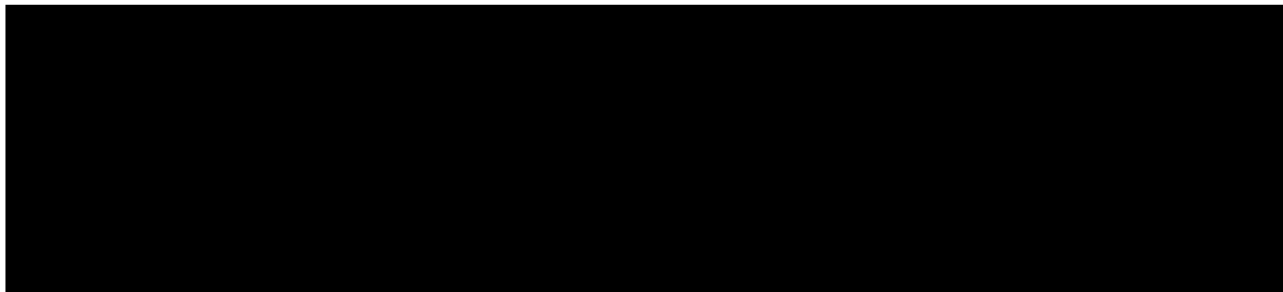


May 20, 2024



Please find enclosed the test results for your samples described as:

1. *Sample 1 = Regular lighter with a flint*
2. *Sample 2 = Piezoelectric light*

The following test was performed:

1. Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Objective

Two (2) samples were submitted for analysis. It was explained that one (1) sample was a standard disposable lighter and one (1) sample was a piezo electric lighter. It was noted that identifying the metals in the residue left on your hands when using the lighters was of interest. It was noted that you were primarily interested in evaluating cerium (Ce) and lanthanum (La) content. ***The goal of this analysis was to determine the concentration of Ce and La in the residues to aid in your research and development.***

Summary of Results

Sample 1 = Regular lighter with a flint was found to contain notably high levels of Ce (209.3 µg/g) and La (105.1 µg/g) while *Sample 2 = Piezoelectric light* contained Ce and La below the reporting limit. ICP-MS results are summarized in **Table 1** and **Table 2**.

Individual Test Results

A summary of the individual test results is provided below. All accompanying data, including spectra, has been included in the data section of this report.

ICP-MS

Sample Preparation (Microwave Digestion)

The fuel for each lighter was exhausted prior to sample preparation. A Kimwipe was used (as a substitute for skin) to strike the respective lighter one hundred (100) times in intervals of ten (10). A visible residue was observed on the Kimwipe used for sample *Sample 1 = Regular lighter with a flint*, but no clear, visible residue was observed on the *Sample 2* Kimwipe. For microwave digestion, the entire Kimwipe of each sample (approximately 0.4 g) was added to a pre-cleaned Teflon microwave vessel along with 1 mL of de-ionized water, 3 mL of TraceMetal Grade nitric acid, and 1 mL of TraceMetal Grade hydrochloric acid. The samples were digested via microwave (UltraWAVE) until complete digestion was achieved. After digestion, the samples were diluted to 50 mL using deionized water. A blank was also prepared using a clean Kimwipe and analyzed to correct for background and possible interferences. All elements analyzed were calibrated with a minimum coefficient of determination of 0.995. Calibration standards were run at the start and the finish of the run and a calibration equation calculated by the average of the two. All samples and calibration standards were analyzed in triplicate.

Results

The elemental analysis results are shown in **Table 1** and **Table 2**. The instrumental reporting limit for Ce and La in the sample solution was 1 ng/mL. *Sample 1 = Regular lighter with a flint* was found to contain notably high levels of Ce (209.3 µg/g) and La (105.1 µg/g) while *Sample 2 = Piezoelectric light* contained Ce and La below the reporting limit. It should be noted that the difference in Ce and La concentrations from samples to blank could potentially be due to the variability of the Kimwipe used for each sample.

Table 1 ICP-MS Results - <i>Sample 1 = Regular lighter with a flint</i>				
Element	Measured Concentrations After Microwave Digestions (ng/mL)			Sample Concentration Before Digestion (µg Element/g Sample) ²
	Method Blank	Measured Concentration	Corrected Concentration ¹	
Ce	142.81753	1897.911	1755.0935	209.3
La	77.535394	958.61794	881.08254	105.1
¹ Measured Concentration – Method Blank ² Sample concentration (µg/g) = $\frac{\text{Corrected Conc.} \left(\frac{\text{ng}}{\text{mL}} \right) \times \text{Final Volume of Solution (50 mL)}}{\text{Sample Mass (0.4193 g)}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$				

Table 2 ICP-MS Results - Sample 2 = Piezoelectric light				
Element	Measured Concentrations After Microwave Digestions (ng/mL)			Sample Concentration Before Digestion (µg Element/mL Sample) ²
	Method Blank	Measured Concentration	Corrected Concentration ¹	
Ce	142.81753	24.469773	< 1.000	< 0.1186
La	77.535394	12.600815	< 1.000	< 0.1186
¹ Measured Concentration – Method Blank ² Sample concentration (µg/g) = $\frac{\text{Corrected Conc.}(\frac{ng}{mL}) \times \text{Final Volume of Solution (50 mL)}}{\text{Sample Mass (0.4216 g)}} \times \frac{1 \mu g}{1000 ng}$				

Analysis Conditions

Microwave Digestion

Instrument	Milestone UltraWAVE
Vessel	15 mL PFA vials
Power	1500 W
Loading Pressure	40 bar
Loading Gas	Nitrogen

ICP-MS

Instrument	Agilent 7900
Autosampler	ESI prepFAST 4DX
Nebulizer	PFA Nebulizer
Spray Chamber	Scott-type double-pass
RF Power	1550 W
Ar Flow	15.0 L/min
Auxiliary Ar Flow	0.9 L/min
Carrier Flow	1 L/min
Integration Time	0.1 s
Acquisition Mode	Spectrum
Sweeping/Replicates	100
RPq for Cerium as CeO (m/z 156)	<2 %

Concentration measurements of major elements determined by ICP have an uncertainty typically on the order of +/- 10%. The uncertainty in the concentrations of trace elements might be significantly higher. Spiking studies can be provided upon request to determine method accuracy

in the sample matrix provided. The uncertainty in the concentrations of trace elements might be significantly higher.

Closing Comments

Jordi Labs' reports are issued solely for the use of the clients to whom they are addressed. No quotations from reports or use of the Jordi name is permitted except as authorized in writing. The liability of Jordi Labs with respect to the services rendered shall be limited to the amount of consideration paid for such services and do not include any consequential damages.

Jordi Labs specializes in polymer analysis and has more than 35 years' experience performing regulatory, quality control and failure testing. We are one of the few labs in the United States specialized in this type of testing. We will work closely with you to help explain your test results and complete your project goals. We appreciate your business and are looking forward to speaking with you concerning these results.

Sincerely,

Tina Dagher

Tina Dagher, M.S.
Chemist II
Jordi Labs LLC

Anthony Grice

Anthony Grice, Ph.D.
Senior Chemist III
Jordi Labs LLC