Determination of calcium and magnesium in lithium carbonate

Introduction:

Battery grade lithium carbonate is the key raw material for the production of cathode materials for lithium-ion batteries. For example, the cathode materials for lithium cobaltate batteries, Lithium iron phosphate battery and ternary batteries are all synthesized on the basis of battery grade lithium carbonate. In addition, battery grade lithium carbonate, as an electrolyte additive of lithium ion battery, can not only significantly improve the safety performance of the battery, but also extend the service life. However, calcium and magnesium ions in the lithium carbonate electrode will block the pores of the ion selective electrode to prevent electrolytic reaction, so it is necessary to detect calcium and magnesium content.

Detection items (Table 1):

Cation	Mg^{2+}	Ca^{2+}

Keywords: Ion chromatography, Lithium carbonate, Lithium-ion batteries.

Instruments and equipment

- **Ion chromatograph**: CIC-D120^{+}
- **Ultra pure water machine**:ECO-S15

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Requirements

Reagents

Unless otherwise specified, all reagents used are superior grade.Mg^{2+},Ca^{2+}standard solution (1000 mg/L).

Deionized Water

When preparing standard samples manually or diluting real samples, please use ASTM filtration and deionization requirements that meet the specifications listed in the table 2.

Table 2: Deionized water specification.

Specification	
Ions Resistivity	≥18.25MΩ·cm
Organics-TOC	<10ppb
Iron/Transition Metals	<1ppb
Pyrogens	<0.03Eu/mL
Particulates（>0.2μm）	<1unit/mL
Colloids-Silica	<10ppb
Bacteria	<1cfu/mL

Chromatography conditions:

Table 3:

Instrument	CIC-D120⁺
Eluent	5 mM MSA
Flow rate	1.0 mL/min
Injection volume	25 μL
Analytical column	SH-CC-3L
Column oven temperature	35℃
Conductivity cell temperature	35℃
Suppressor current	15 mA

Sample preparation

Accurately weigh 1 g (accurate to 0.0001 g) of the sample into a 100 mL volumetric flask, dilute it with Ultrapure water to the scale, and pass 0.22 μ m filter membrane injection analysis.

Standard chromatogram

Standard chromatogram, As shown in below:

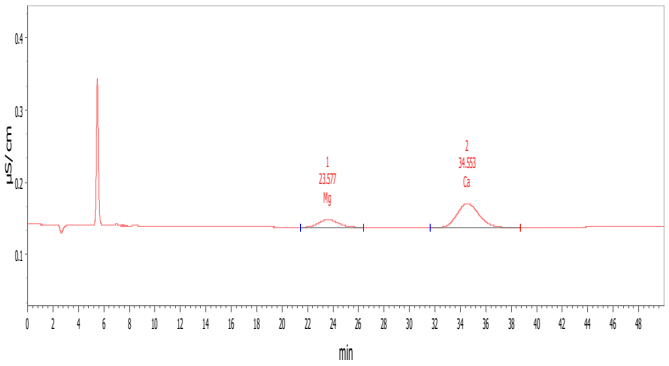

Figure 1. Chromatogram of standard sample.

Table 4 Standard sample result table:

Ions	Time [min]	Concentration [mg/L]	Area [(μS/cm)*min]	Height [μS/cm]
Mg	24.633333	0.030000	0.009310	0.005047
Ca	35.760000	0.200000	0.039466	0.019079

Blank chromatogram

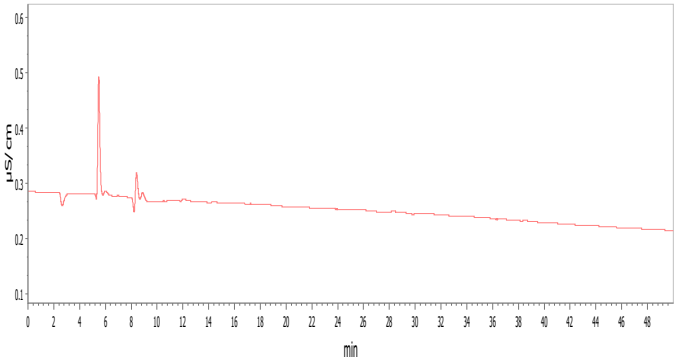

Figure 3. Chromatogram of blank

Sample chromatogram

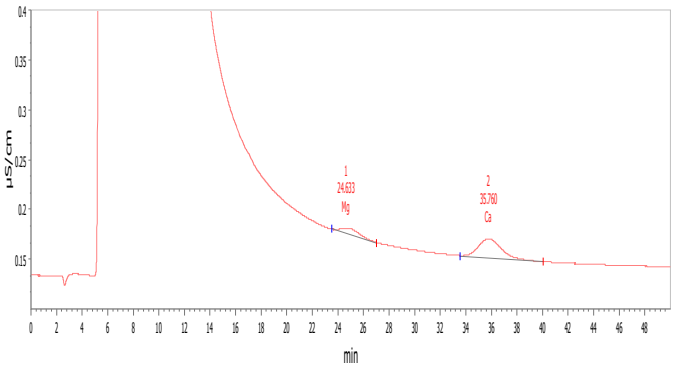

Figure 4. Chromatogram of sample

Results and calculations

Table 4: Sample test result

Concentration（mg/kg）		
Lithium carbonate	Mg^{2+}	Ca^{2+}
	18.25	**1.82**

Note: There may be differences in test results between different methods and laboratories.

Feasibility analysis and conclusion

The above experiments prove that the detection method has good resolution and is suitable for the determination of the content of the components to be measured in the sample.