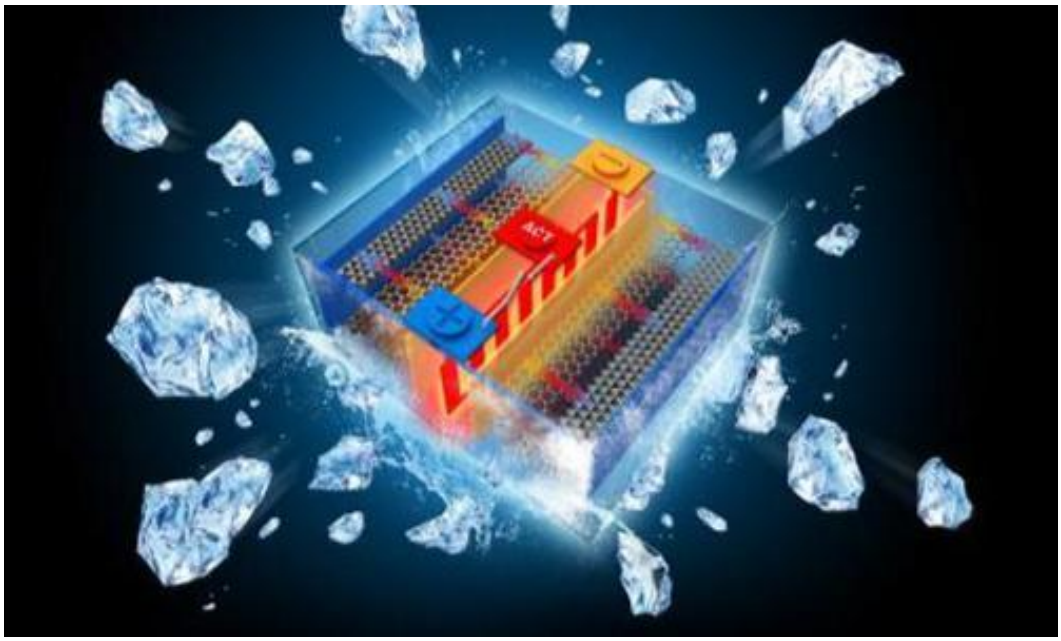

Detection of anions in lithium battery electrolyte

Introduction:

The development of lithium-ion batteries has brought a series of innovations and changes, but the chloride ion content in the electrolyte has always been an important factor restricting its performance and application. Therefore, in order to ensure the performance of lithium-ion batteries, it is necessary to detect the chloride ion content in the electrolyte. This article introduces the use of ion chromatography to determine the content of chloride ions and other ions in electrolytes.

Detection items (Table 1):

Anion	F^-	Cl^-	SO_4^{2-}	PO_4^{3-}

Keywords: Chloride， Ion chromatography, lithium battery, electrolyte.

Instruments and equipment

- **Ion chromatograph**: CIC-D160$^+$
- **Ultra pure water machine**:ECO-S15

Qingdao Shenghan Chromatograph Technology Co., Ltd

Requirements

Reagents

Unless otherwise specified, all reagents used are superior grade. F^-, Cl^- ,SO_4^{2-} ,PO_4^{3-}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 (Anions):

Table 3: Anions analysis conditions

Instrument	CIC-D160⁺
Eluent	0-25 min，6 mM KOH 25.1-35 min，25-30 mM KOH 35.1-55 min，60 mM KOH 55.1-60 min，6 mM KOH
Flow rate	1.0 mL/min
Injection volume	5 μL
Analytical Column	SH-AC-11
Column oven temperature	35℃
Conductivity cell temperature	35℃
Suppressor current	150 mA

Sample preparation

Accurately weigh sample 1#: 0.5954 g; 2#: 0.0827 g, 3#:1.2152 g; Dilute pure water to the mark in a 100 mL plastic volumetric flask and mix evenly. Path through 0.22 μM filter membrane,then us IC test.

Standard chromatogram

Standard chromatogram, As shown in below:

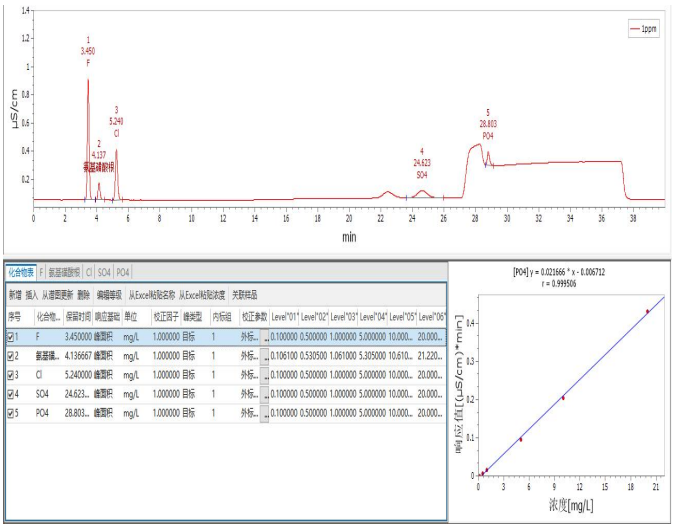

Figure 1. Chromatogram of standard sample.

Blank chromatogram

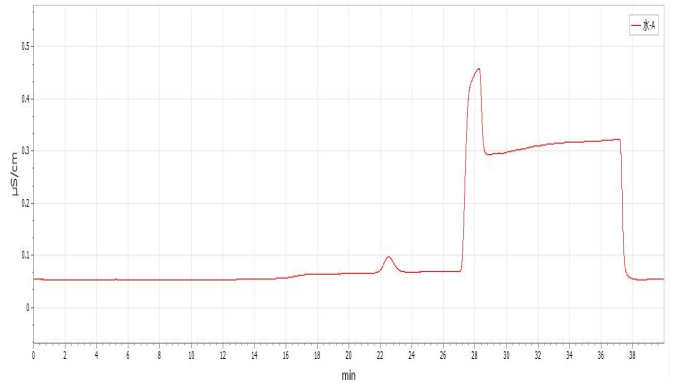

Figure 2. Chromatogram of blank

Sample chromatogram

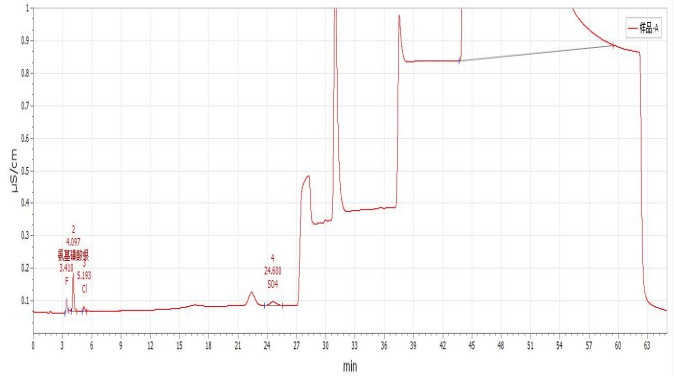

Figure 3. Chromatogram of sample 1#

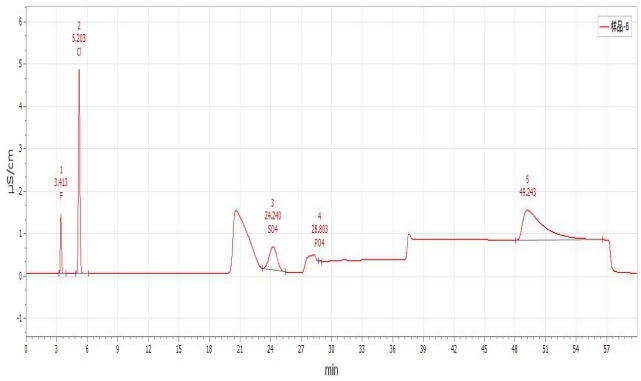

Figure 4. Chromatogram of sample 2#

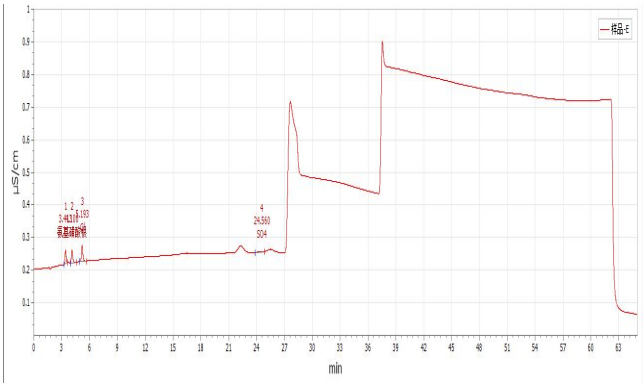

Figure 5. Chromatogram of sample 3#

Results and calculations

Table 4: Sample test result

Sample	Content（mg/kg）			
	F^-	Cl^-	SO_4^{2-}	PO_4^{3-}
1#	8.01	27.58	72.814	ND
2#	1933.23	14371.59	12041.85	514.18
3#	4.02	21.15	23.47	ND

Remarks: ① ND indicates not detected; ② The measured value has been deducted from the blank value; ③ There may be differences in testing 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.