Detection of anions in boric acid

Introduction:

Boric acid is widely used in many industries, especially in nuclear power plants. It can be used as a reagent to control reaction rates, but the operating environment usually involves high temperatures and pressures. In this case, some anions can accelerate the corrosion of metal pipelines. Therefore, measuring the anion content in boric acid reagents is particularly important. The high sensitivity of ion chromatographs has unique advantages in anion detection.

Table 1: Detection items

Anion	Fluoride	Chloride	Sulfate	Phosphate

Keywords: Boric acid,Anions, Ion Chromatograph.

Instruments and equipment

- **Ion chromatograph**: CIC-D160^{+}
- **Autosampler:** SHAD-1
- **Ultra pure water machine**:EU-20

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Requirements

Reagents

Unless otherwise specified, all reagents used are superior grade. Commercially available certified standard solutions for fluoride, chloride, sulfate, phosphate (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: Analysis conditions

Instrument	CIC-D160⁺
Eluent	0-6 min，10 mM KOH 6.1-18 min，10-50 mM KOH 18-26 min，50 mM KOH 26.1-30 min，10 mM KOH Bottle:50mM Boric acid
Flow rate	1.0 mL/min
Injection volume	2000 μL
Analytical column	SH-NP-1
Column oven temperature	35℃
Conductivity detector temperature	35℃
Suppressor current	150 mA

Sample preparation

Weigh 1 g of the sample into a 50 mL volumetric flask, dissolve it in ultra-pure water, shake to volume, pass through a 0.22um filter membrane, and inject for analysis.

Blank chromatogram

Blank chromatogram, As shown in below:

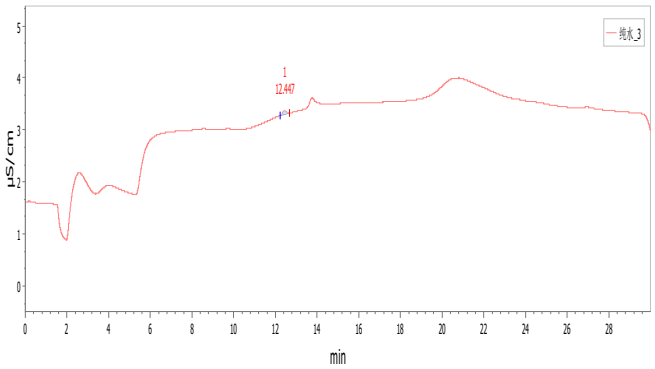

Figure 1. Chromatogram of blank sample.

Sample chromatogram

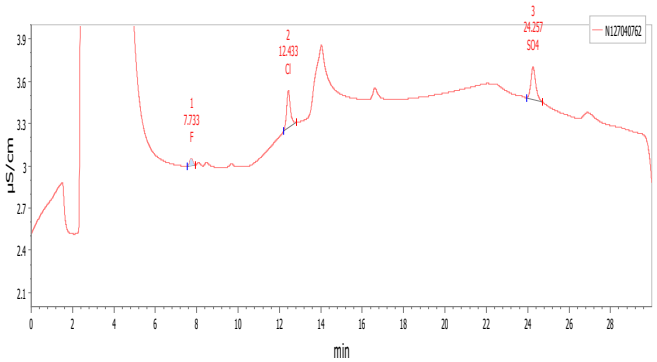

Figure 2. Chromatogram of sample 1#

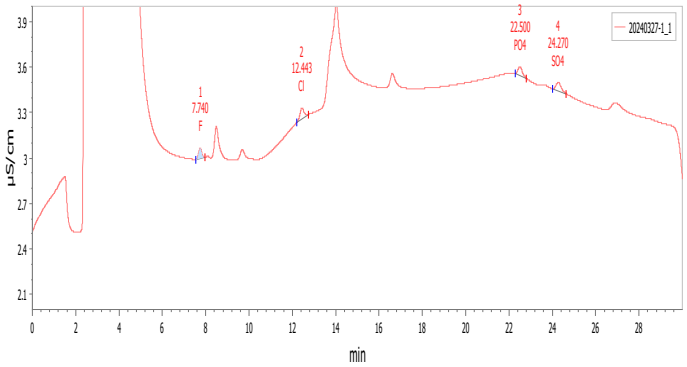

Figure 3. Chromatogram of sample 2#

Results and calculations

Table 4: Sample test result (Unit: mg/kg)

Sample	F^-	Cl^-	PO_4^{3-}	SO_4^{2-}
1#	0.02268	0.14526	ND	0.29440
2#	0.03129	0.02761	0.13563	0.06617

Remarks: ① ND indicates not detected or below the detection limit.②During the experiment, it is easy to be contaminated, and experimental personnel are required to strictly follow the operating procedures.

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.