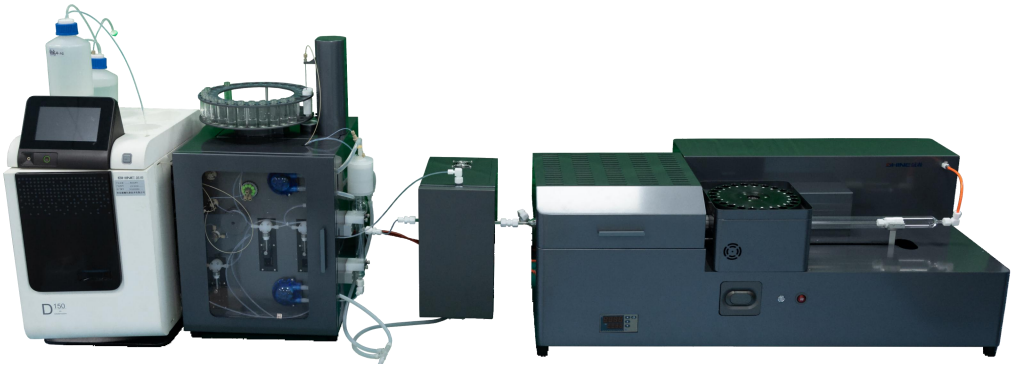
Detection of fluoride in activated carbon

Introduction:

Fluoride exist in natural water and are essential micronutrients for the human body, preventing tooth softening and promoting hard tissue mineralization. According to data reports, the maximum acceptable concentration of fluoride in drinking water is less than 1.5 mg/L. The incidence of high fluoride content (>1.5mg/L) in groundwater is common in both shallow and deep water.

Excessive fluoride (>1.5mg/L) in drinking water can be removed through various fluoride removal technologies. Fluorine removal technology can be divided into several important categories, including chemical precipitation, membrane processes, activated carbon adsorption, and ion exchange. The activated carbon adsorption process is the most commonly used technology for removing fluoride from drinking water.



Detection items (Table 1):

Anion	F^-

Keywords: On-line ion chromatography, Fluoride

Instruments and equipment

- **Ion chromatograph**: SH-CIC-3200
- **Ultra pure water machine**:ECO-S15

Qingdao Shenghan Chromatograph Technology Co., Ltd

Requirements

Reagents

Unless otherwise specified, all reagents used are superior grade. F^- anions 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	SH-CIC-3200
Eluent	15 mM KOH
Flow rate	1.0 mL/min
Injection volume	25 μL
Analytical Column	SH-AC-23
Column oven temperature	35℃
Conductivity cell temperature	35℃
Suppressor current	50 mA

Sample preparation

First, dry the sieved sample in a 105 ℃± 2 ℃ oven for 1 hour. After removal, cool it to room temperature.Weigh an appropriate amount of sample into the sample boat and perform combustion ion chromatography testing.

Table 4:Sample preparation

No.	Weight（g）	Volume (mL)	Diluting solvent
1#	0.2115	100	NaOH solution
2#	0.2516	100	NaOH solution
3#	0.4374	100	NaOH solution
4#	0.2375	100	NaOH solution
5#	0.4271	100	NaOH solution

Standard chromatogram

Standard chromatogram, As shown in below:

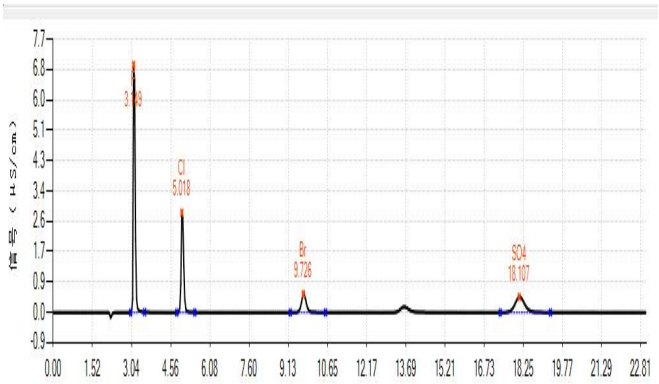


Figure 1. Chromatogram of standard sample.

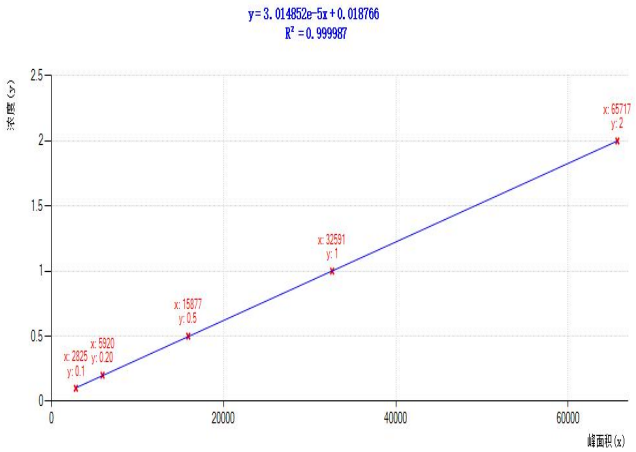


Figure 2. Linearity of standard sample.

Blank chromatogram

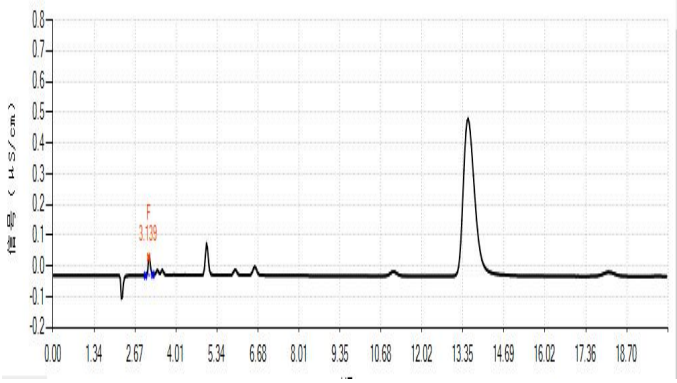


Figure 3. Chromatogram of blank

Sample chromatogram

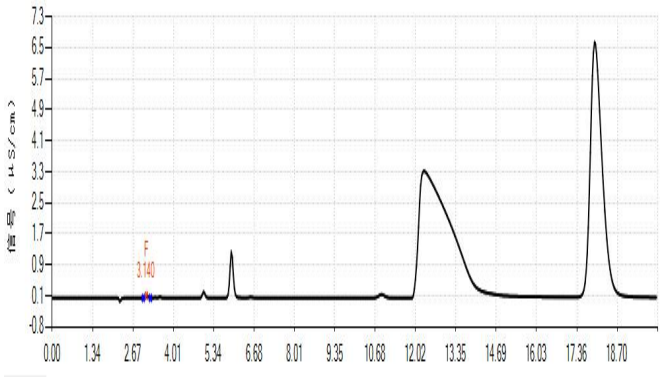


Figure 4. Chromatogram of sample 1#

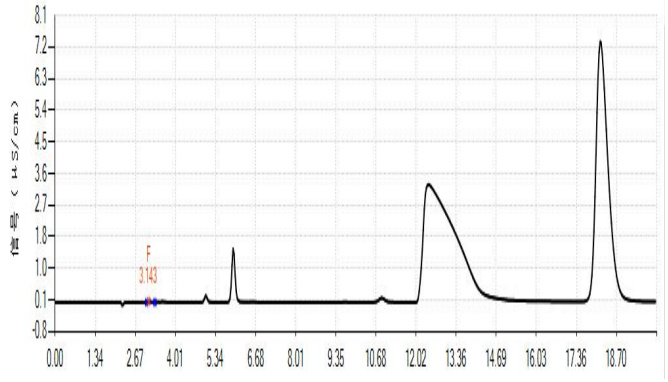


Figure 5. Chromatogram of sample 2#

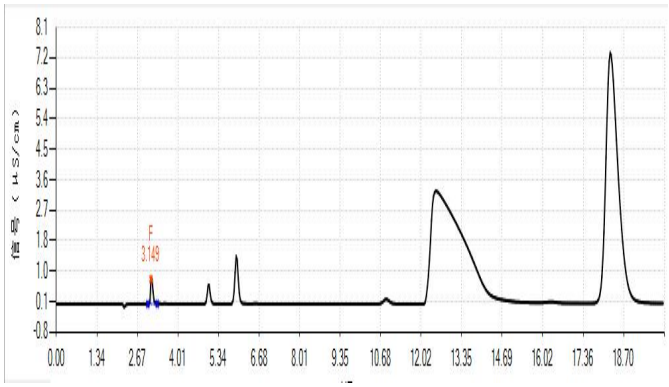


Figure 6. Chromatogram of sample 3#

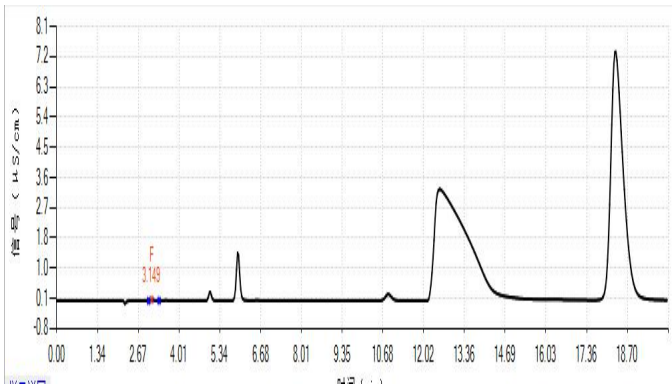


Figure 7. Chromatogram of sample 4#

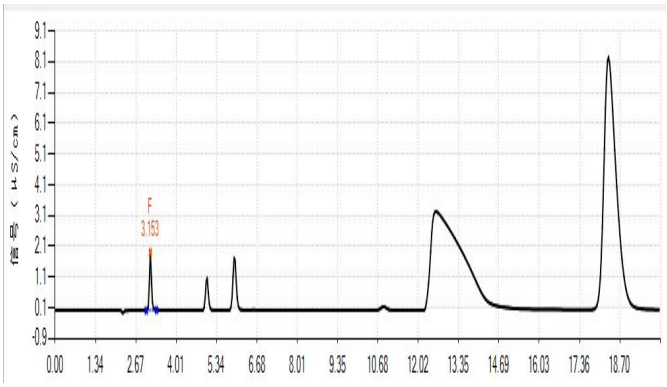


Figure 8. Chromatogram of sample 5#

Results and calculations

Table 5: Sample test result

Sample	F^-（mg/L）
1#	5 mg/kg
2#	5 mg/kg
3#	23.07mg/kg
4#	5 mg/kg
5#	61.61mg/kg

Remarks: ① The measured value has been deducted from the blank value; ② 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.