Determination of anion in seawater

Introduction:

In recent years, with the importance of ocean development and application, great progress has been made in the exploitation of ocean water and ocean energy. However, there are still difficulties and unknown areas in the study of ocean water. The composition of seawater is quite complex, and the content of chemical elements varies greatly. It is a mixed solution with complex chemical components, including water, a variety of chemical elements and gases dissolved in water. There are many kinds of anions and cations in seawater, and the concentration difference between them is large, so it is difficult to analyze and determine various ions.In the analysis of conventional ions in seawater, ion chromatograph is the best instrument with high accuracy and efficiency.

Keywords: Ocean, Seawater, Ion chromatography

Instruments and equipment

- **Ion chromatograph**: CIC-D180
Qingdao Shenghan Chromatography Technology Co., Ltd

- **Ultra pure water machine**: UPT-I-20L
Sichuan youpu Chaochun Technology Co., Ltd

Requirements

Reagents

All reagents used are superior grade pure or better,Purchase certified standard solutions F^-、Cl^-、Br^-、NO_3^-、PO_4^{3-}、SO_4^{2-} standard solutions (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 1.

Table 1: 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

Sample preparation

Dilute the sample 40 times, filter it through 0.22 μm filter membrane, Sample preparation completed

Chromatographic conditions

Eluent: 4.8 mM Na_2CO_3+3.6 mM $NaHCO_3$
Flow rate: 0.7 mL/min
Injection volume: 5 μL
Guard column:SH-GP-2
Analytical Column: SH-AP-2
Column oven temperature: 35℃
Conductivity cell temperature: 35℃
Suppressor current: 60 mA

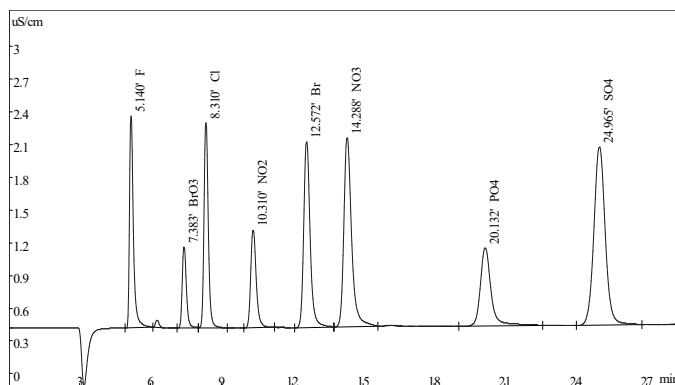## Standard chromatogram

Standard chromatogram,As shown in below:

Figure 1. Chromatogram of standard sample.

Table 2: Data of standard solution

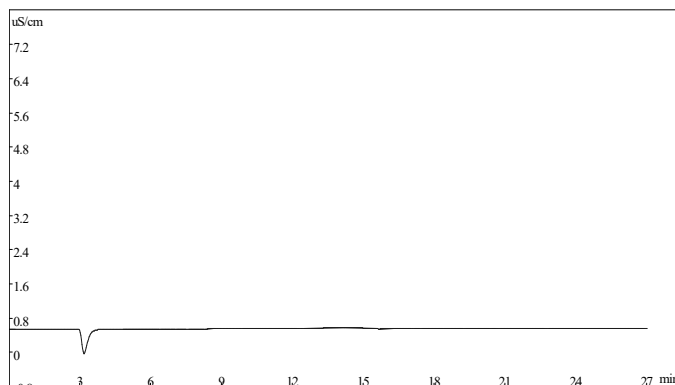| Compound name	Retention time[min]	Concentration[mg/L]	Area	Height[μS/cm]
F^-	5.140	2	19824170	1943938
BrO_3^-	7.383	5	8133178	741450
Cl^-	8.310	3	21155611	1873274
NO_2^-	10.310	5	13461363	896221
Br^-	12.572	10	29874122	1699595
NO_3^-	14.288	10	37043859	1725367
PO_4^{3-}	20.132	10	21424234	713925
SO_4^{2-}	24.965	10	52231526	1629334

Comparison testing (blank)
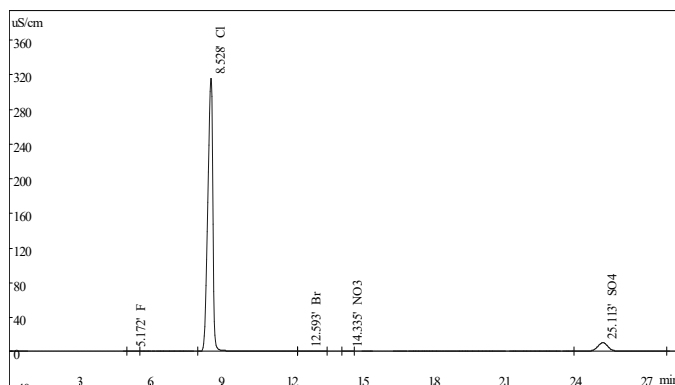

Figure 2.Blank chromatogram

Sample chromatogram

Figure 3. Chromatogram of sample 1#

Results and calculations

Table 3:Sample test results（mg/L）

Sample	F^-	Cl^-	Br^-	NO_3^-	PO_4^{3-}	SO_4^{2-}
1#	1.980	22805	54.00	1.286	ND	2318

Remarks: ① the blank value has been deducted from the measured value; ② Different methods and different laboratories may have different test results.

Precautions

It is easy to be polluted in the process of the experiment, and the experimental personnel are required to operate in strict accordance with the operating procedures.

Feasibility analysis and conclusion

Through the above experiments, it is proved that the detection method has good separation and is suitable for the determination of the content of the components to be measured in the sample.