



Detection of sulfur in coal mines

Introduction:

Sulfur in coal usually exists in the form of organic and inorganic sulfur. The sum of various forms of sulfur in coal is called total sulfur. The sulfur in coal is a harmful impurity for coking, gasification, combustion, etc. It causes steel to become brittle, equipment to corrode, and combustion generates sulfur dioxide, causing atmospheric pollution. Therefore, sulfur content is one of the important indicators for evaluating coal quality. The coal sample is subjected to high-temperature combustion in an oxygen flow, causing various forms of sulfur in the coal to oxidize and decompose into sulfur oxides. After being absorbed by the absorption liquid, it is analyzed and detected using an ion chromatograph, which is convenient and fast.

Detection items (Table 1):

Anion	SO ₄ ²⁻
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Keywords: Ion chromatography, Coal, Sulfate.

Instruments and equipment

- **Ion chromatograph:** SH-CIC3000
- **Ultra pure water machine:** ECO-S15

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Requirements

Reagents

Unless otherwise specified, all reagents used are superior grade. SO₄²⁻ 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	SH-CIC3000
Eluent	2 mM Na ₂ CO ₃ + 10 mM NaHCO ₃
Flow rate	1.5 mL/min
Injection volume	25 μL
Analytical column	SH-AC-4
Column oven temperature	35°C
Conductivity cell temperature	35°C
Suppressor current	75 mA

Sample preparation

Weigh 0.05 g of coal sample and inject it into the sample boat for online combustion ion chromatography analysis.

Standard chromatogram

Standard chromatogram, As shown in below:

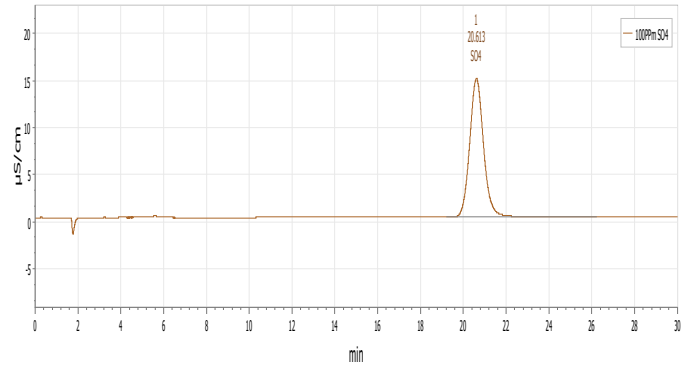


Figure 1. Chromatogram of standard sample.

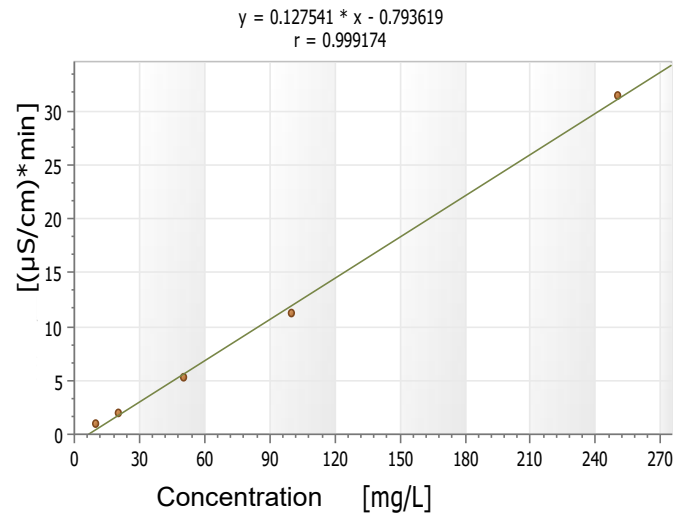


Figure 2. Standard linearity

Blank chromatogram

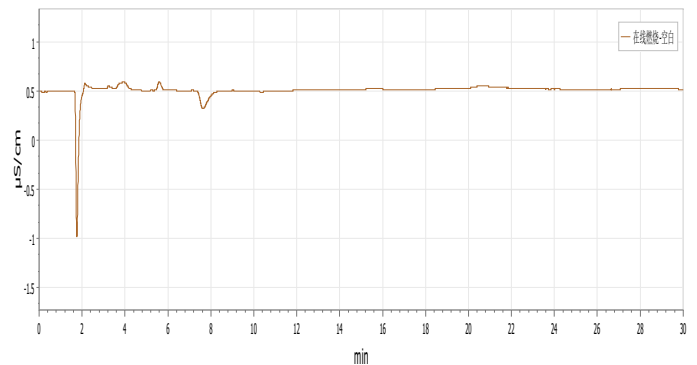


Figure 3. Chromatogram of blank

Sample chromatogram

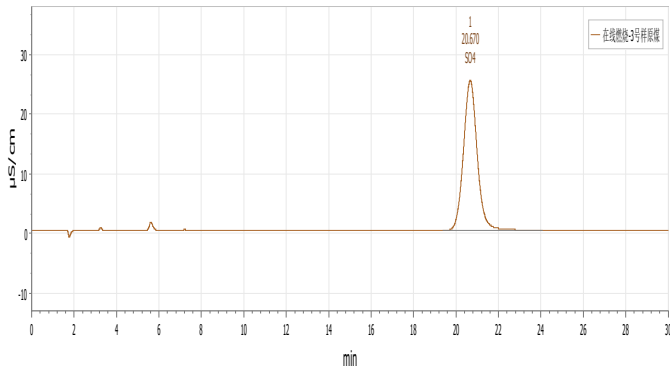


Figure 4. Chromatogram of sample 1#

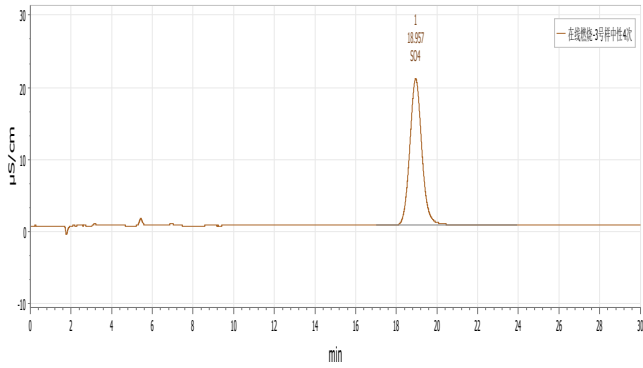


Figure 5. Chromatogram of sample 2#

Results and calculations

Table 4: Sample test result

Sample	Concentration (mg/g)		
	SO4	S	%
1#	78.72	26.24	2.62
2#	54.74	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.