

Sheet No. **AQF2100 IM 047** Inorganic Materials

## Determination of halogens and sulfur in cement by combustion ion chromatography

Instruments : AQF-2100H system  
 Detection method : Ion chromatography  
 Related standard :

### Introduction

Concentrations of fluorine (F), chlorine (Cl), bromine (Br), iodine (I), and sulfur (S) can be determined accurately by combustion ion chromatography (CIC), a system in which samples are safely combusted by Automatic Quick Furnace (model AQF-2100H) and injected online to an ion chromatograph (IC).

### Method

- Combustion ion chromatography  
 Sample was pyrolysed in argon (Ar) carrier gas, then pyrolysis gas was combusted in oxygen (O<sub>2</sub>) gas. Halogens in the sample were converted into hydrogen halide (HX) and/or halogen gas (X<sub>2</sub>), and sulfur in the sample was converted into sulfur oxide (SO<sub>x</sub>), which were collected and further converted into halide ion (X<sup>-</sup>) and/or sulfate ion (SO<sub>4</sub><sup>2-</sup>) in the absorbent. This absorbent was injected to IC, and analyzed.

Flowchart

Weighing ⇒ combustion ⇒ collection ⇒ IC

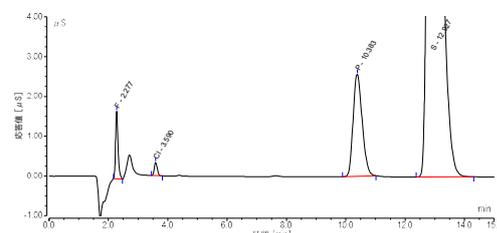
### Samples

- Reference materials (from Japan Cement Association)  
 211R Portland Cement  
 Ordinary Portland Cement  
 Portland Blast-furnace Slag Cement

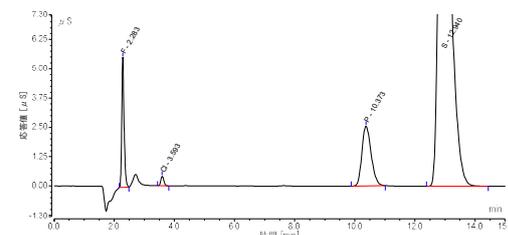
### Results

Name		Size (mg)	WO <sub>3</sub> (mg)	Content (%)		
				F	Cl	S
211R Portland Cement	1	10.3	107	0.019	0.0079	0.75
	2	10.1	101	0.019	0.0076	0.75
	3	10.9	102	0.019	0.0077	0.75
	Average			<b>0.019</b>	<b>0.0078</b>	<b>0.75</b>
	RSD%			0.1	2.3	0.2
Certified			-	0.0094	0.87	
Ordinary Portland Cement	1	10.0	103	0.057	0.0090	0.70
	2	10.3	103	0.057	0.0090	0.70
	3	10.7	101	0.057	0.0090	0.71
	Average			<b>0.057</b>	<b>0.0090</b>	<b>0.70</b>
	RSD%			0.5	0.4	0.9
Certified			-	-	0.82	
Portland Blast-furnace Slag Cement	1	10.4	100	0.060	0.0059	0.93
	2	10.2	103	0.060	0.0059	0.91
	3	10.7	99	0.061	0.0060	0.93
	Average			<b>0.060</b>	<b>0.0059</b>	<b>0.92</b>
	RSD%			1.6	0.6	1.3
Certified			-	-	1.04	

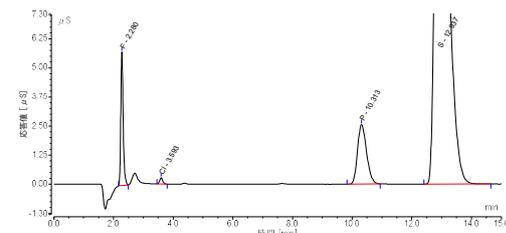
- Chromatogram  
211R Portland Cement



- Ordinary Portland Cement



- Portland Blast-furnace Slag Cement



\*This sheet is provided as a reference and does not guarantee analytical values. Optimal conditions may vary depending on external factors, such as the analysis environment, and the nature of the sample.