

Sheet No.

AQF PT 029E Reference Materials

Determination of chlorine, bromine and sulfur in polyethylene certified reference material 1/2

Instruments : AQF-2100H System, HF-210, GA-210, ABC-210/ASC-240S

Method : Combustion-ion chromatography

Related standard :

Polyethylene is widely used for containers and packaging materials. As halogen compounds may be added to polyethylene materials for various purposes, it is critically important to know the content of the halogen compounds when polyethylene materials are disposed or recycled.

Concentrations of fluorine, chlorine, bromine, iodine, and sulfur can be determined and accurately by using a combustion ion chromatography (CIC) system combining an Automatic Quick Furnace Model AQF-2100H which safely combusts samples with an ion chromatograph.

Sample name	ERM-EC680 k (IRMM Standard Sample)																																				
Sample status	Resin pellet																																				
Measuring items	Chlorine (Cl), Bromine (Br), Sulfur (S)																																				
Measurement principle	Sample is thermally decomposed in argon (Ar) atmosphere, then combusted in oxygen (O ₂) atmosphere. Halogens in the sample are converted to hydrogen halide and halogen gas and sulfur turns into sulfur oxide. These components are collected into absorbing solution and converted to halide ion and sulfate ion. The resulting solution is analyzed by injecting into an ion chromatograph (IC). Analyzing flow [Sample weighing]→[Combustion]→[Collection of combustion gas]→[IC analysis]																																				
Parameters	<p>1. AQF-2100H</p> <p>Sample size : 40 to 50mg (2 to 3 pellets) Sample boat : Ceramic sample boat, SXSMBS Additive : None Pyrolysis tube : Quartz tube filled with quartz wool Absorbent : 300ppm Hydrogen peroxide / water Mode : Constant volume mode</p> <p>HF-210 Heater Temp. Inlet : 1000degC Outlet : 1100degC Gas flow Ar : 200 ml/min O₂ : 400 ml/min</p> <p>GA-210 Absorbent volume : 20 ml Sampling loop : 100 ul Absorption tube : For 20 ml Water supply : 2 Ar flow for water supply : 100 ml/min</p> <p>ABC-210/ASC-240S</p> <table border="1"> <thead> <tr> <th></th> <th></th> <th>1st</th> <th>2nd</th> <th>3rd</th> <th>4th</th> <th>5th</th> <th>End</th> <th>Cool</th> </tr> </thead> <tbody> <tr> <td>Position</td> <td>(mm)</td> <td>50</td> <td>95</td> <td>120</td> <td>160</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Time</td> <td>(sec)</td> <td>30</td> <td>60</td> <td>60</td> <td>30</td> <td></td> <td>300</td> <td>60</td> </tr> <tr> <td>Speed</td> <td>(mm/sec)</td> <td>5</td> <td>1</td> <td>0.06</td> <td>5</td> <td></td> <td>5</td> <td>40</td> </tr> </tbody> </table> <p style="text-align: right;">Ar Time 0 (sec) O₂ Time 300(sec)</p>			1st	2nd	3rd	4th	5th	End	Cool	Position	(mm)	50	95	120	160				Time	(sec)	30	60	60	30		300	60	Speed	(mm/sec)	5	1	0.06	5		5	40
		1st	2nd	3rd	4th	5th	End	Cool																													
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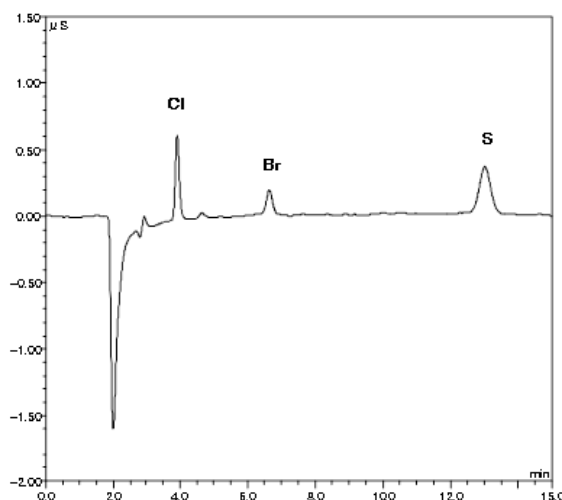
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2. Ion chromatograph

Ion chromatograph : DIONEX ICS-1500
 Column : DIONEX Ion Pack AG12A / Ion Pack AS12A
 Eluent : 2.7mM Na₂CO₃ / 0.3mM NaHCO₃
 Eluent flow : 1.50ml / min
 Detector : Conductivity
 Suppressor : ASRS-4-mm
 Measuring time : 15min
 Sampling loop : 100 μl using GA-210 sampling loop
 Calibration : F Cl Br S :0.1ppm to 5.0ppm

Results

Chromatogram



Results

	Cl(ppm)	Br(ppm)	S(ppm)
n=1	102	99.4	72.5
2	100	99.7	73.4
3	99.4	99.4	73.6
4	100	99.6	78.2
5	101	94.4	72.7
Average	101	98.5	74.1
RSD(%)	1.2%	2.3%	3.2%
Certified value	102±3	96±4	76±4

Remarks

*Handling of reagents: Confirm labels and safety data sheets of reagents and handle them with enough care.
 *Automation is possible by using an Automatic Sample Changer, ASC-240S.
 When ASC-240S is used, the boat to be used will be a ceramic boat, TX3SCX.

*This application sheet is provided as reference, and does not assure the measurement results. Please consider analysis environment, external factors and sample nature for optimal conditions before the measurement.

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