Determination of chlorine and sulfur in wood chips

Wood chips are a raw material for paper. They are also contained in most of wastes. As impurities when wood chips are used as a raw material for paper, and as wastes containing wood chips, it is critically important to know the halogen content out of consideration to the environment. 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
Wood chips

### Sample status
Crushed pieces

### Measuring items
Chlorine (Cl) Sulfur (S)

### Measurement principle
Sample is thermally decomposed in argon (Ar) atmosphere, then combusted in oxygen (O₂) 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**

```markdown
[Sample weighing] ⇒ [Combustion] ⇒ [Collection of combustion gas] ⇒ [IC analysis]
```

### Parameters

**1. AQF-2100H**
- Sample size: 40 to 50mg
- Sample boat: Ceramic sample boat, SXSMBS
- Additive: WO₃ 100 to 300mg
- Pyrolysis tube: Quartz tube filled with quartz wool
- Absorbent: 90ppm Hydrogen peroxide / water
- Mode: Constant volume mode

**HF-210**
- Heater Temp. Inlet: 1000degC
- Outlet: 1100degC
- Gas flow Ar: 200 ml/min
- O₂: 400 ml/min

**GA-210**
- Absorbent volume: 5 ml
- Sampling loop: 100 ul
- Absorption tube: For 10 ml
- Water supply: 2
- Ar flow for water supply: 100 ml/min

**ABC-210/ASC-240S**
- 1st 2nd 3rd 4th 5th End Cool
- Position (mm): 110 150 180
- Time (sec): 30 30 30 600 60
- Speed (mm/sec): 10 10 10 10 10

**Ar Time (sec) O₂ Time**
- 600(sec)
2. Ion Chromatography

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

<table>
<thead>
<tr>
<th></th>
<th>Cl (ppm)</th>
<th>S (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=1</td>
<td>92.0</td>
<td>106</td>
</tr>
<tr>
<td>2</td>
<td>93.0</td>
<td>102</td>
</tr>
<tr>
<td>Average</td>
<td>92.5</td>
<td>104</td>
</tr>
</tbody>
</table>

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.