Application Note:
IN-03004

Total Chloride Analysis in Aromatic Hydrocarbons

Key Words
- Chloride
- Hydrocarbons
- Petrochemicals

Introduction

Aromatic Hydrocarbons are light petrochemicals used as intermediate products within petrochemical cracking processes. The Total Chloride content in for example benzene and p-xylene samples is tested to optimize the catalytic processes. Chloride compounds will also cause corrosion of the piping and equipment within the chemical production process, with higher costs of operation as a result.
This application note describes the analysis performance of the ECS 3000 Total Chloride analyzer with use of the coulometric detection technique in aromatic hydrocarbons.

Principle of operation

The benzene and p-xylene samples are automatically introduced into the oxygen rich and heated (1000 °C) combustion tube by use of the liquids sample introduction module and a syringe injection needle.
In this process the bounded (organic) chlorides (OX) convert into inorganic chlorides (HCl). A sulfuric acid scrubber conditions the combustion gases.
The conditioned gasses are directed into the titration cell, which is filled with acetic acid electrolyte solution.
The electrodes are positioned in the cell and connected to the microcoulometer. Here titration of the formed hydrogenchloride (Cl-) with silver-ions (Ag+) will occur.

Referenced Documents

The Total Chloride Analyzer, model ECS 3000, complies with the following standard methods for this particular application:

ASTM D5808	Standard Test Method for Determination of Total Organic Chloride in Aromatic Hydrocarbons and Related Chemicals by Microcoulometric Detection
ASTM D5194	Standard test method for trace Chloride in Liquid Aromatic Hydrocarbons

System settings

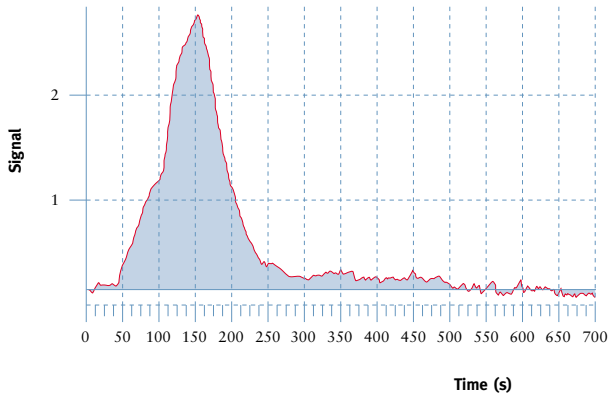
Argon carrier	100 mL/min
Oxygen combustion	180 mL/min
Oxygen turbo	80 mL/min
Oxygen bypass	50 mL/min
Inlet temp.	500 °C
Furnace temp. I	1000 °C
Furnace temp. II	1000 °C
Scrubber temp.	270 °C
Sample volume	100 µL

Results Chloride Analysis

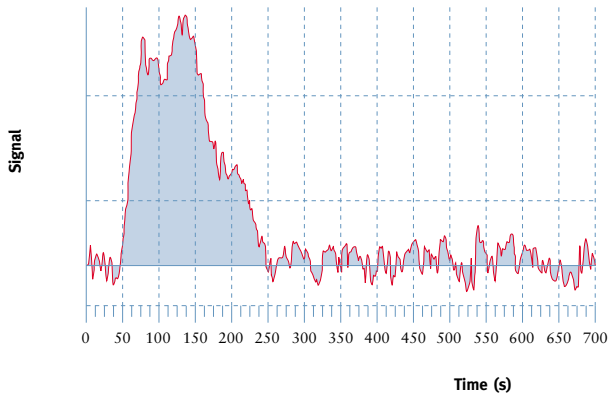
Standard	Q (uC)	Total Chloride (mg/kg)
4.5 ppm Cl	1262.7	4.64
4.5 ppm Cl	1259.7	4.63
4.5 ppm Cl	1268.3	4.66
4.5 ppm Cl	1250.9	4.60
4.5 ppm Cl	1266.1	4.65

Sample	Q (uC)	Total Chloride (mg/kg)
p-Xylene	273.2	1.00
p-Xylene	288.0	1.06
p-Xylene	278.1	1.02
p-Xylene	288.1	1.06
p-Xylene	277.6	1.02
p-Xylene	301.3	1.11

Sample	Q (uC)	Total Chloride (mg/kg)
Benzene I	77.8	0.29
Benzene I	70.9	0.26
Benzene I	71.1	0.26
Benzene I	61.6	0.23
Benzene I	66.2	0.24
Benzene I	71.4	0.26
Benzene II	23.0	0.08
Benzene II	24.7	0.09
Benzene II	24.6	0.09
Benzene II	25.8	0.09
Benzene II	26.1	0.10
Benzene II	25.1	0.09



P-xylene



Benzene II

Summary

Sample	Q (uC)	Average (mg/kg)	SD (mg/kg)	RSD (%)
Standard 4.5 ppm	1261.54	4.64	0.023	0.5
p-Xylene	284.38	1.05	0.040	3.8
Benzene I	69.52	0.26	0.021	8.0
Benzene II	24.88	0.09	0.006	7.0

N=6

Conclusion

The results shows a good repeatability and accuracy for the total chloride application in aromatic hydrocarbons, which makes the ECS 3000 a good performing unit for low ppm analysis.

Note: A complete Application Report with detailed test results is available on special request.

Thermo Electron Corporation has direct subsidiary offices in North America, Europe and Japan. To complement these direct subsidiaries, we maintain a network of representative organizations throughout the world. Use this reference list or visit our Web site to locate the representative nearest you.

Austria
Tel: +43 (0)1 333 50 34 0

France
Tel: +33 (0)1 39 30 53 00

Germany
Tel: +49 (0)6102 3671 0

Italy
Tel: +39 02 6601 6351

Netherlands
Tel: +31 76 5724840

©2003 Thermo Electron Corp. All rights reserved worldwide. We make no warranties, expressed or implied, in this product summary, and information is subject to change without notice. All product and company names are property of their respective owners.

IN-03004

Thermo
ELECTRON CORPORATION
www.thermo.com

Thermo Electron Corporation
Voltaweg 22
2627 BC Delft
The Netherlands

T +31 (0) 15 257 1314
F +31 (0) 15 257 2297
E info@thermoeuroglas.com