



ASTM D5580 Standard Test method for determination of Benzene, toluene, ethylbenzene, p/m-xylene, o-xylene, C₉ and heavier Aromatics, and total aromatics in finished Gasoline by Gas Chromatography (GC).

KEY WORDS: Aromatics, Benzene, Toluene, Gasoline, ASTM D5580

INTRODUCTION

SCION Instruments offers a solution for the determination of aromatics in finished gasoline products, according to standard test method ASTM D5580. ASTM D5580 describes the determination of benzene, toluene, ethylbenzene, the xylenes, C₉ and heavier aromatics and total aromatics in finished motor gasoline by GC.

Aromatics and ethers are added to gasoline to reduce carbon monoxide emissions and increase octane number. However, aromatics are toxic for health and environment. Test methods to determine benzene and the aromatic content of gasoline are necessary to assess product quality and to meet new fuel regulations.

ASTM D5580 (aromatics) and ASTM D4815 (Oxygenates, ethers & aromatics in reformulated Gasoline applications) uses a similar SCION Instruments configuration. Therefore SCION Instruments offers an analyzer with these two methods in one configuration, for a wide range of gasoline analysis. For more information about method ASTM D4815, see SCION Instruments application note AN0002.

This application is applicable on the SCION Instruments 4X6 and the new 8X00 GC-platform, Figure 1 shows the new SCION Instruments 8X00 GC platform in combination with an 8400PRO Autosampler.



Figure 1. SCION Instruments 8X00 GC platform equipped with the 8400PRO autosampler.

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RESULTS AND DISCUSSION

The ASTM D5580 is a standard test method for the determination of benzene and other aromatics in Gasoline.

Common alcohols and ethers (oxygenates) present in gasolines do not interfere with the analysis of benzene and other aromatics by this test method.

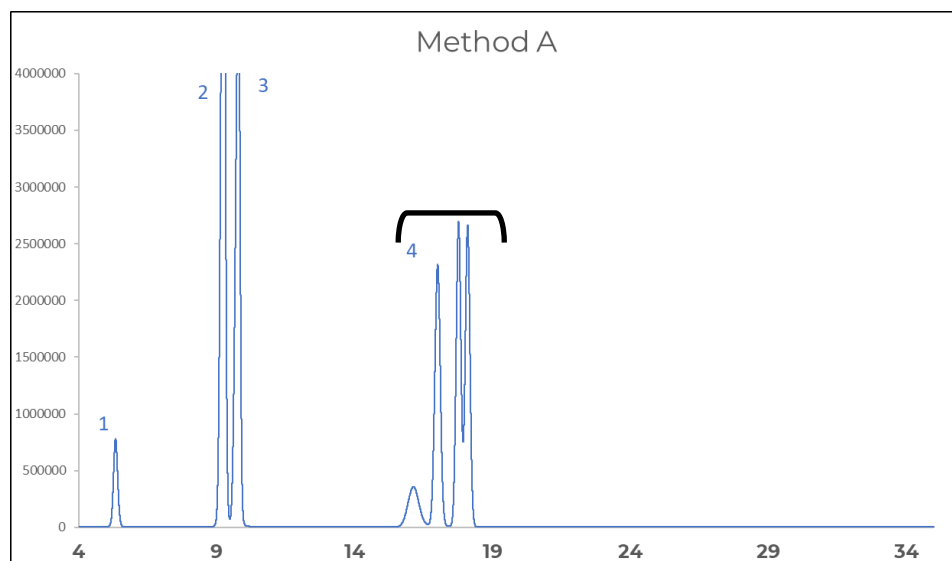
ASTM D5580 is divided in two methods, method A and B. Both methods cover the following concentration ranges in liquid volume %, for the preceding aromatics: benzene 0.1—5 %, toluene 1—15%, individual C₈ aromatics 0.5—10%, total C₉ and heavier aromatics 5—30% and total aromatics 10—80%. Table 1 shows the analytical conditions of the system for both method A and B.

Method A

Method A describes the determination of benzene and toluene using 2-Hexanone as internal standard (IS). After the elution of the IS the flow of the capillary column is reversed to backflush for the separation of C₈, heavier aromatics, C₁₀ and heavier non aromatics. Figure 2 shows a chromatogram of an injection of *ASTM D5580 Valve timing mix*, dissolved in iso-octane.

Table 1. Analytical conditions system

Part	Settings
	220°C
Injector	Split ratio 11:1
Column 1	TCEP Micro packed column
Column 2	SCION-1
Oven Program	60°C (hold 6 min), 2°C/min to 115°C
Carrier	Helium
Column flow	10 ml/min
	FID with ceramic jet, 300°C
Detector A	Air: 300 ml/min, Fuel gas (H ₂): 30 ml/min, Make up (N ₂): 10 ml/min
Autosampler	8400PRO
Software	Compass CDS



Peak ID	Compound Name
1	Benzene
2	Toluene
3	2-Hexanone (IS)
4	C ₈ Aromatics

	Benzene	Toluene
N	10	10
Mean	48650	113757
Stdev	791	1934
RSD (%)	1.63	1.7

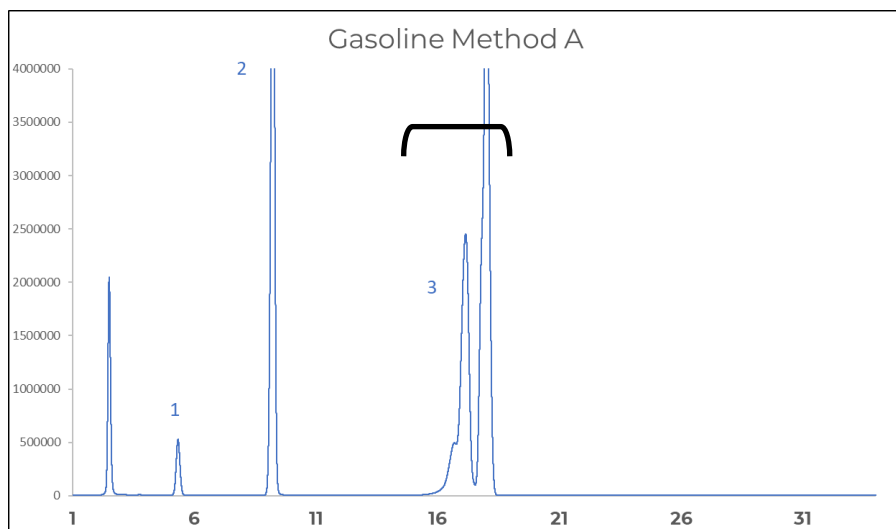
Table 2: Repeatability data

Figure 2: Chromatogram method A, D5580 Valve timing standard, using FID

Figure 2 is showing a excellent resolution between benzene, toluene (> 12). Table 2 is showing excellent repeatability results for 10 consecutive injections of the same sample.

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RESULTS AND DISCUSSION



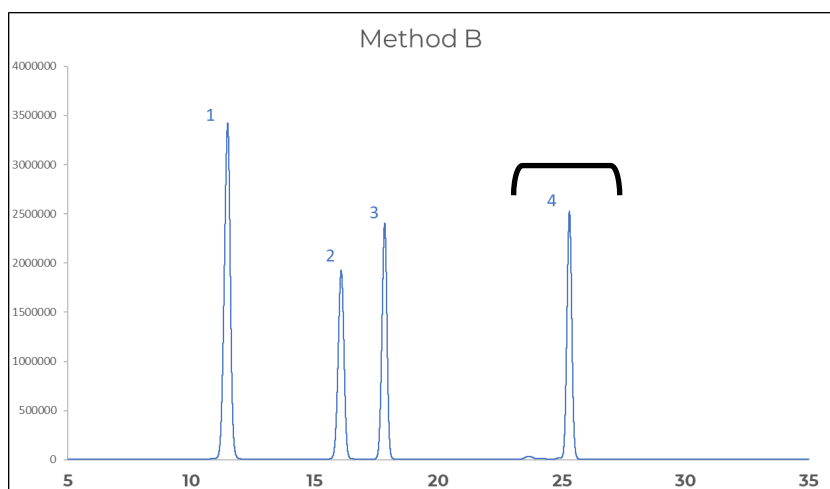
Peak ID	Compound Name
1	Benzene
2	Toluene
3	C ₈ Aromatics, back-flush fractions

Figure 3: Chromatogram method A Gasoline sample, using FID

Figure 3 is showing a perfect resolution between benzene and toluene. (>12)

Method B

Method B is used for the analysis of ethylbenzene, o-xylene and C₉+ Aromatics. Benzene, toluene, C₁₂ and lighter hydrocarbons elute from the pre column to the vent or to the optional monitor detector (TCD). The TCEP column elutes ethylbenzene and the remaining aromatic portion is directed into the capillary column. 2-Hexanone and C₈ aromatic compounds elute in order of their boiling points. After elution of o-Xylene, C₉ and heavier aromatics are detected.



Peak ID	Compound Name
1	2-Hexanone (IS)
2	Ethylbenzene
3	o-Xylene
4	C ₉ + Aromatics

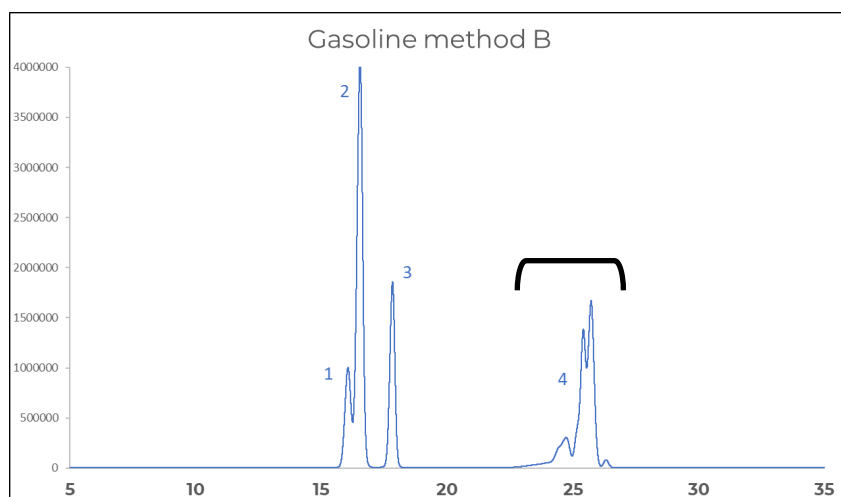
	2-Hexanone (IS)	Ethylbenzene	O-Xylene
N	10	10	10
Mean	9543944	2899349	3650058
Stdev	150259	48357	59525
RSD (%)	1.57	1.67	1.63

Table 3: Repeatability data

Figure 4: Chromatogram method B, D5580 Valve timing standard, using FID

Figure 4 is showing perfect resolution between all components. Table 3 is showing good repeatability results for 10 consecutive injections of the same sample.

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Peak ID	Compound Name
1	Ethylbenzene
2	m/p-Xylene
3	o-Xylene
4	C ₉ + aromatics, Back-flush fractions

Figure 5: Chromatogram method B Gasoline sample, using FID

Figure 5 is showing the chromatogram of an injection of gasoline. Note: Benzene and toluene are vented or detected with the optional monitor detector (TCD).

Table 4: Part numbers analyzer D4815/D5580

CONCLUSION

Part	Part number
8300-GC D4815/D5580 analyzer 120V	839974601
8300-GC D4815/D5580 analyzer 230V	839974602
8500-GC D4815/D5580 analyzer 120V	859974601
8500-GC D4815/D5580 analyzer 230V	859974602
D5580 VALVE TIMING STANDARD 10X2 ML	ST50000030

The SCION Instruments 8X00 GC-platform is a very robust and suitable system for the determination of aromatics in Gasoline, following the ASTM D5580 standard method. The experimental data demonstrates that separation is easily achieved using the SCION Instruments 8500, along with great repeatability values.

ASTM D5580 (aromatics) and ASTM D4815 (Oxygenates, ethers & aromatics in reformulated Gasoline applications) uses a similar SCION Instruments configuration. Therefore SCION Instruments offers an analyzer with these two methods in one configuration, for a wide range of gasoline analysis. For more information about method ASTM D4815, see SCION Instruments application note AN0002. For part numbers of the combined analyzer, see table 4.

The equipment of the 8X00-GC analyzer is pre determined based on the hardware of ASTM D4815 and ASTM D5580. Analyzers can be equipped with an 8400PRO or 8410PRO autosampler for automated injections to increase sample throughput.

For ordering information or customisation, please contact your local sales representative.

Although the 4X6-GC series is not shown in this application note, it is possible to perform this analysis on the SCION instruments 4X6 GC series.

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