



UOP744, Aromatics in hydrocarbons by Gas Chromatography

KEY WORDS: UOP, aromatics, hydrocarbons

INTRODUCTION

The UOP744 describes the method for individual determination of C₆ through C₁₀ aromatic compounds in petroleum distillates or aromatic concentrates having a final boiling point of 210°C or lower.

The advantage of UOP744 is that this method may be used to provide a distribution of C₈ aromatics an/or C₉ and heavier aromatics. In addition this method also describes an extension for these components which have a final boiling point less than 344°C (nC₂₀). When these methods are used the limit of quantitation of a single aromatic component is 0.01 mass-%.

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.



Figure 1. SCION Instruments 8300 and 8500 GC platform equipped with the 8400PRO autosampler.

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EXPERIMENTAL

This analysis can be implemented on the 8300-GC and the 8500-GC platform. The analysis was performed on the Scion 8500-GC analyser equipped with an FID and a 100 positions 8400PRO autosampler.

The UOP744 is a perfect and simple method for the determination of aromatics in hydrocarbons using a flame ionization detector (FID), it can be used for components that have a final boiling point of 210°C and with a few changes even to 344°C.

The mass-% composition of the sample is obtained by normalization of the peak areas using the relative response factors. It is also possible to use this method for the distribution of C₈ aromatics and/or C₉ and heavier aromatics.

Interference with toluene and benzene can be caused by C₁₀ and heavier non-aromatic components. If this occurs it is possible to choose an other method provided by SCION Instruments for example: ASTM D5443, D5580, D6729, D6839 or the UOP690.

Table 1. Analytical conditions (final boiling point 210°C)

Injector	Splitless 200:1, 230 °C
Column	SCION WAX-MS 50°C (5.0 min), 8°C/min to 100°C
Oven Program	(0 min), 2°C/min to 120°C (0 min), 20°C/min to 240°C
Carrier	Hydrogen, 2.3 ml/min FID with ceramic jet, 250°C
Detector	Air: 300 ml/min, Fuel gas (H ₂): 30 ml/min, Make up (N ₂): 30 ml/min
inj. Volume	0.5 µl
Autosampler	8400
Software	Compass CDS

RESULTS

All the results were calculated according to the described method in UOP744.

The theoretical relative response factors (TRRF) were determined and showed a deviation from the theoretical value below 5% for the components.

Table 2: Components determined with UOP744

Peak Nr.	Component	Peak Nr.	Component
1	Benzene	22	1-Methyl-4-n-propylbenzene
2	Toluene	23	1,4-Diethylbenzene
3	Ethylbenzene	24	n-Butylbenzene
4	p-Xylene	25	1,3-Dimethyl-5-ethylbenzene
5	m-Xylene	26	1,2-Dimethylbenzene
6	i-Propylbenzene	27	1-Methyl-2-n-propylbenzene
7	o-Xylene	28	1,2,3-Trimethylbenzene
8	n-Propylbenzene	29	1,4-Dimethyl-2-ethylbenzene
9	1-Methyl-4-ethylbenzene	30	1,3-Dimethyl-4-ethylbenzene
10	1-Methyl-3-ethylbenzene	31	1,2-Dimethyl-4-ethylbenzene
11	tert-Butylbenzene	32	Indane
12	iso-Butylbenzene	33	1,3-Dimethyl-2-ethylbenzene + 2-methylindane
13	1,2,5-Trimethylbenzene	34	1,2-Dimethyl-3-ethylbenzene
14	sec-Butylbenzene	35	1,2,4,5-Tetramethylbenzene
15	Styrene	36	1,2,3,5-Tetramethylbenzene
16	1-Methyl-2-ethylbenzene	37	5-Methylindane
17	1-Methyl-3-isopropylbenzene	38	1,2,3,4-Tetramethylbenzene
18	1-Methyl-4-isopropylbenzene	39	4-Methylindane
19	1,2,4-Trimethylbenzene	40	Naphtalene
20	1,3-Diethylbenzene + 1-Methyl-2-methyl-2-isopropylbenzene	41	2-Methylnaphtalene
21	1-Methyl-3-n-propylbenzene	42	1-Methylnaphtalene

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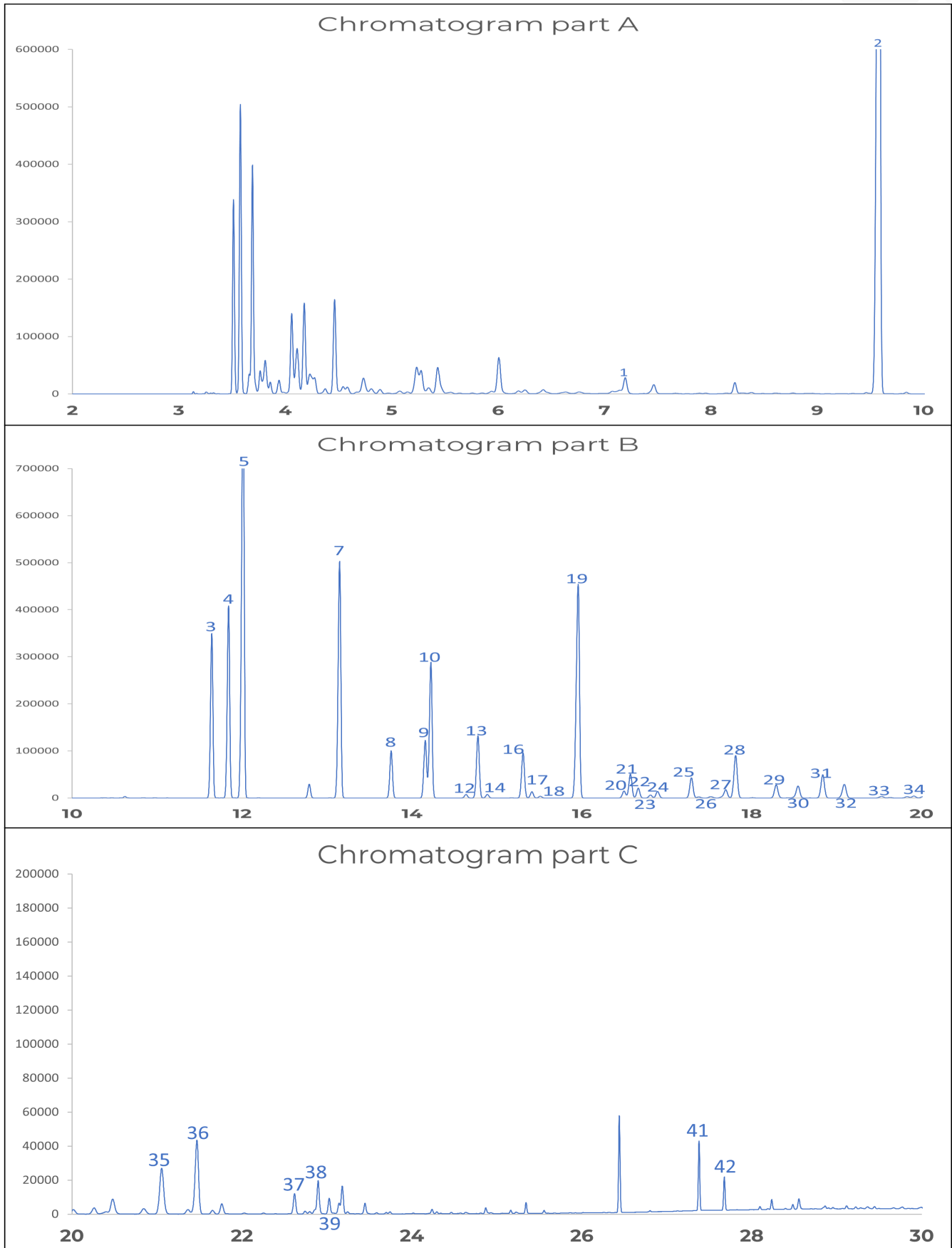


Figure 2. Example of an reformate sample chromatogram.

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In addition it showed that the three measurements performed for these components had a deviation below 0.5% amongst the results.

These results were excellent since the deviation against the theoretical values have to be below 5% and the deviation amongst the results no more than 3%.

After establishing the TRRF a reformat mix was injected to determine the mass-%.

After analysis it shows that the sample contained 68.59 mass% non aromatics, 18.87 mass% C₉ aromatics and 10.41 mass% C₁₀/C₁₁ aromatics.

The method showed excellent repeatability that are well withing specification described in the UOP 744.

Figure 2 shows an example of a chromatogram from a reformat sample, the numbers shown in the chromatogram are corresponding with the numbers in table 2.

CONCLUSION

The Scion 8X00-GC analyser equipped with a split/spitless injector, Scion Instruments column and FID is capable of performing UOP744 in a way that complies to the method.

The non-aromatics, C₉ and C_{10/11} were determined on the basis of mass-%, The quantitation limit for any reported component is 0.01 mass-%. These components were analysed with the method that has a boiling point less than 210°C, it is also possible to perform the other described methods with the 8X00-GC.

The equipment of the 8X00-GC analyser is pre determined, 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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