

# Application Data Sheet

## No. 16

### GCMS

Gas Chromatograph Mass Spectrometer

## Analysis of Light Oil Using a GC × GC-MS System

GC × GC, the latest in chromatographic technology, achieves high-level separation through direct connection of 2 different types of columns. The following shows an example of light oil analysis using a GC × GC system.

#### Analysis Conditions

Table 1: Analysis Conditions

GC × GC modulator	: ZX1-GC × GC modulator	
GC-MS	: GCMS-QP2010 Ultra	
[GC × GC]		[MS]
Column	: 1st DB-1 (15 mL. x 0.25 mmI.D., 1.0 μm) 2nd Rtx-WAX (2.5 mL. x 0.1 mmI.D., 0.1 μm)	Interface temperature: 240°C Ion source temperature: 200°C Solvent elution time: 0.3 min Data sampling time: 0.5 min to 150 min Measurement mode: Scan Mass range: <i>m/z</i> 35-500 Scan speed: 20,000 <i>u</i> /sec
Injection quantity	: 0.5μL	
Injection quantity	: Split (split ratio 50)	
Vaporization chamber temperature	: 275°C	
Column oven temperature	: 40 °C -> (1.8 °C /min) -> 240 °C (40 min)	
Control mode	: Pressure (150 kPa -> (1.4 kPa/min) -> 300 kPa (40 min)	
Modulation time	: 5 sec	
Hot pulse time	: 0.35 sec (300 °C)	

#### Results

Zoex GC Image is a special multipurpose GC × GC analysis software package. It is capable of directly reading in GC × GC data obtained with GCMSsolution, converting it to a 2-dimensional image, and then analyzing it.

Fig. 1 shows a 2-dimensional representation created by GC Image from the results for light oil analyzed using a GC × GC-MS system. By using a high-polarity column as the second column, it is possible to separate the paraffin from aromatic series, thereby obtaining a blob distribution pattern reflecting the compound structure.

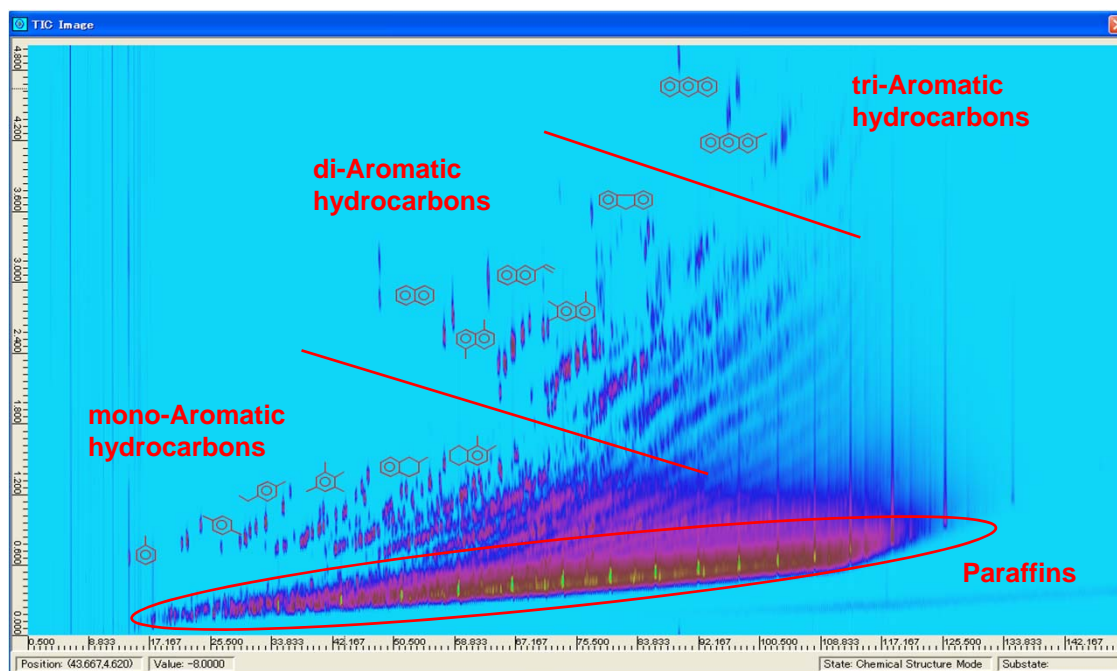
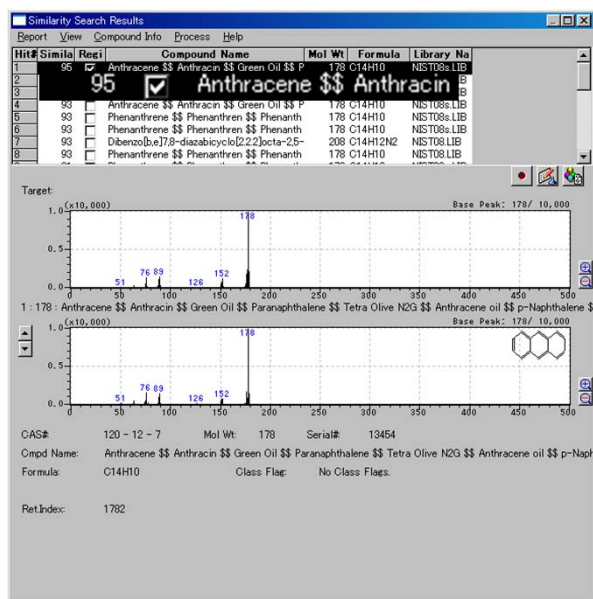


Fig. 1: 2-Dimensional Image of the GC × GC-MS Analysis Results for Light Oil

Fig. 2 shows the anthracene similarity search results using a typical GC-MS system and a GC × GC-MS system. The degree of similarity is low with a typical GC-MS system, but with GC × GC-MS, a high degree of similarity is shown. This is because high-level separation can be achieved by modulation with 2 different types of columns, and the sharp peaks characteristic to GC × GC analysis can be picked up by the 20,000 u/sec scan speed of the GCMS-QP2010 Ultra.

A



B

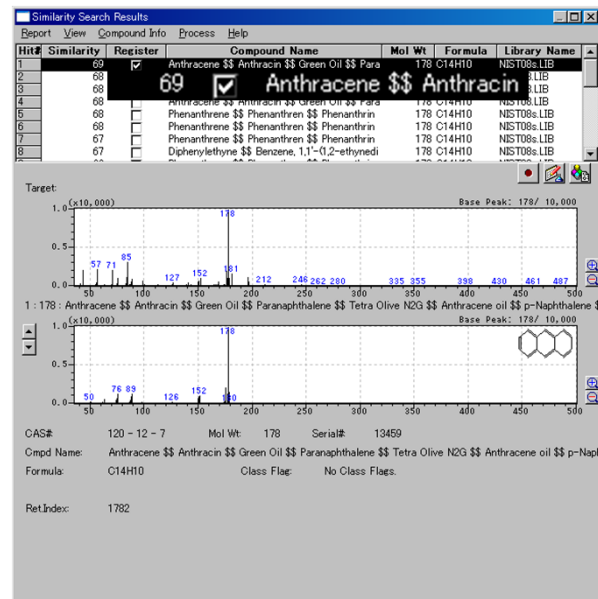


Fig. 2: (A) GC × GC-MS and (B) GC-MS Anthracene Similarity Search Results

## Summary

GC × GC systems use the latest chromatographic technology to achieve high-level separation through direct connection of 2 different types of columns. In this way, 2-dimensional images are obtained with, for example, boiling point and polarity as the axes. This method is optimal for the separation of target substances from complicated matrices that are problematic for ordinary GC or GC-MS systems, and for analysis by type from 2-dimensional chromatogram patterns. It can be used for analysis in a variety of fields, including natural products, foodstuffs, fragrances, environmental science, and petro-chemistry.

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First Edition: October 2011



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