AccuTOF-GCv Series

Qualitative Analysis by Comprehensive 2D GC / TOFMS [2]

Analysis of polycyclic aromatic hydrocarbons in kerosene

Introduction

Comprehensive two-dimensional gas chromatography (GC×GC) is a kind of continuous heart-cut GC system. Two different types of columns are connected via a modulator in the same GC oven. By using the two columns together, this technique provides very high separation capabilities when compared to one-dimensional GC analysis. However, GC×GC systems require a fast data acquisition detection system in order to record the very narrow time width peaks observed in the GC chromatograms. The JEOL AccuTOF-GC is a time-of-flight mass spectrometer (TOFMS) that fully meets this high speed data acquisition requirement at 25Hz (0.04sec) so it can be successfully used as the detection system in combination with GC×GC.

In this work, the AccuTOF-GC was used for the qualitative analysis of polycyclic aromatic hydrocarbons in kerosene by GC×GC -TOFMS.

Method

Sample kerosene

Measurement Conditions

For GC×GC

System:	Agilent 6890GC Zoex KT2004
Column:	1st: HP-1ms (30m × 0.25mm I.D., 0.25µm) 2nd: DB-17 (2m × 0.1mm I.D., 0.1µm)
Oven temp.:	50C（1min）→ 5C/min → 280C（6min）
Injection temp.:	280C
Injection volume:	0.5µl [Split mode (1:200)]
Carrier gas:	He (Const. pressure: 680kPa)
Trapping interval:	6 sec

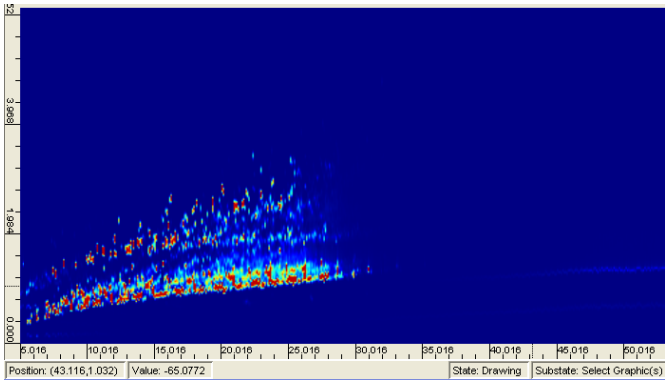
For MS

MS:	AccuTOF-GC
Ionization method:	EI+（70eV, 300µA）
Acquired range:	*m/z* 35-500

Spectrum recording interval:0.04 sec (25Hz)

Results and Discussion

All of the chromatograms were created by using the Zoex GC Image software. The GC×GC 2D and 3D chromatograms for kerosene are shown in Fig.1. The X-axis corresponds with the separation by the 1st column which is based on differences in boiling point, and the Y-axis corresponds with the separation by the 2nd column which is based on differences in polarity. Also, the colors in the chromatograms show the intensity of each peak. The intensity increases from light blue to yellow to red. The red color shows that the compound intensity is over the settings value for the maximum intensity.



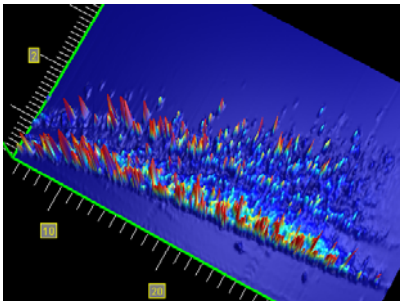


Fig.1 TICC of kerosene by GC×GC (Top: 2D image, bottom: 3D image)

GC×GC can classify all of the compounds in a series of saturated and unsaturated hydrocarbons. Fig.2 shows the GC×GC mass chromatograms for *m/z* 178 and 202 which were used to identify the tri-cyclic and tetra-cyclic aromatic hydrocarbons present in the sample. Additionally, the mass spectra of compound A and B are shown in Fig.2. These compounds were identified as anthracene (compound A) and pyrene (compound B).

Conclusions

The AccuTOF-GC has the capability of high speed mass spectrum recording which allows it to be combined with a GC×GC system. Also, this system can be used for the analysis complicated samples such as petroleum products, perfumes and environmental pollutant samples with high sensitivity and high mass resolving power throughout the MS analysis.

Acknowledgement

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Zoex's GC x GC system is provided and supported through the Zoex sales and support network and may not be available in your territory. Contact your local JEOL representative for detail.

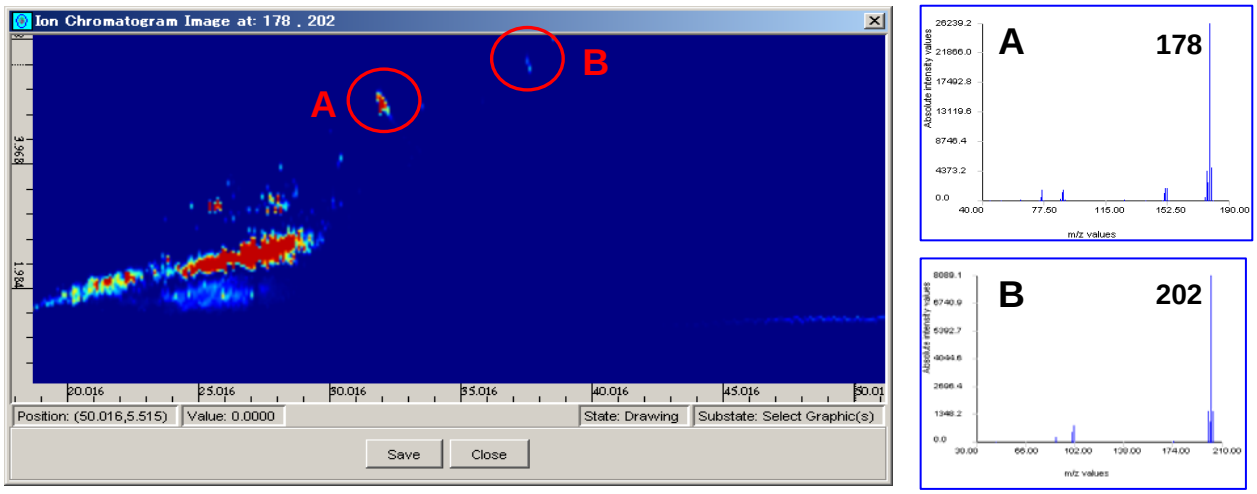

Fig.2 : GC×GC mass chromatogram of m/z 178 and 202 for polycyclic aromatic hydrocarbons and the corresponding mass spectra for the tri- and tetra-cyclic aromatic hydrocarbons.

