AccuTOF-GCv Series

Qualitative Analysis by Comprehensive 2D GC / TOFMS [1]

Comparison of kerosene and diesel oil

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 to analyze kerosene and diesel oil samples by GC×GC -TOFMS.

Method

Sample: kerosene and diesel oil

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:	JMS-T100GC AccuTOF-GC
Ionization method:	EI+（70eV, 300µA）
Acquired m/z range:	*m/z* 35-500
Spectrum recording interval:	0.04 sec (25Hz)

Results and Discussion

All of the chromatograms were created by using the GC Image software (Zoex). The GC×GC total ion current chromatograms (TICCs) for kerosene (top) and diesel oil (bottom) 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 color in the chromatograms represents the intensity of each peak. The intensity increases from light blue to yellow and then to red. The red color shows that the compound intensity is over the settings value for the maximum intensity.

In general, kerosene is a mixture of C9 - C15 hydrocarbons, and diesel oil is a mixture of C11 - C15 hydrocarbons. The GC×GC chromatograms show that

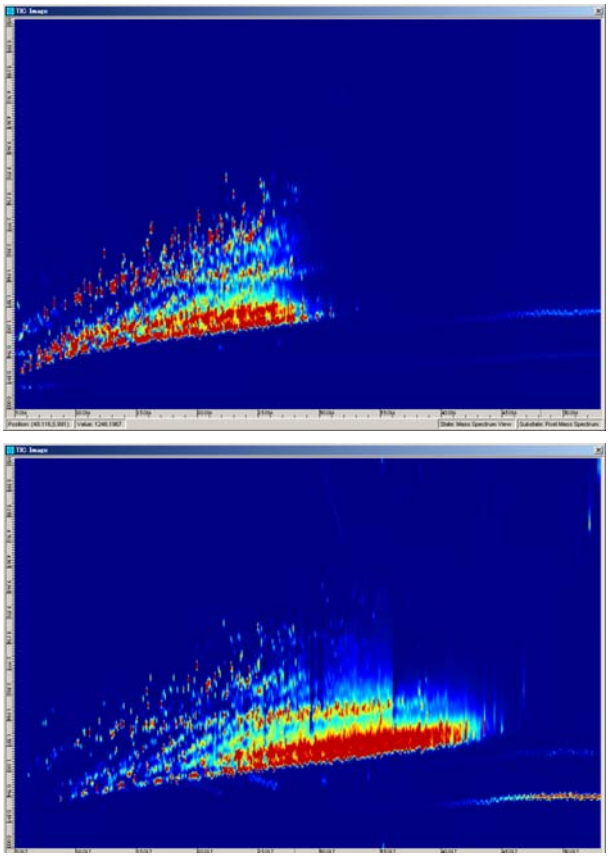
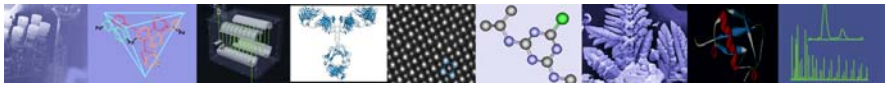


Fig.1 The GC×GC TICCs for kerosene (top), diesel oil (bottom)



kerosene includes more low-boiling point compounds while diesel oil includes more high-boiling point compounds. Additionally, the GC×GC separates saturated hydrocarbons, unsaturated hydrocarbons, aromatic hydrocarbons, etc. by the differences in their polarities.

Conclusions

The AccuTOF-GC has the capability of high speed spectrum recording which allows it to be combined with a GC×GC system. Furthermore, it is possible to have good reliability with high sensitivity and high mass resolving power.

Acknowledgement

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The Zoex GC×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.