JEOL MS Data Sheet

MS Tips

Mass Spectrometry Application Group
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Qualitative analysis by comprehensive 2D GC / TOFMS [2]
- Analysis of polycyclic aromatic hydrocarbons in kerosene -

Comprehensive two-dimensional gas chromatography (GC x GC) is a kind of a continuous hard-cut GC system. Two different types of columns are connected via a modulator in the same GC oven. The GC x GC technique has a very high separating power compared to single GC. GC x GC systems requires a fast acquiring detection system, because the peak width in the GC chromatogram is very narrow. This requirement of very fast data acquisition is fully met in the AccuTOF-GC. Since the maximum spectrum recording interval on JEOL AccuTOF-GC is 25Hz (0.04sec), the system can successfully be used as detection system in combination with a GC x GC system.

This application note shows the results of the qualitative analysis for polycyclic aromatic hydrocarbons in kerosene by GC x GC-TOFMS.

<Sample and measurement conditions>

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:	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 the chromatograms were created by using GC Image software (ZOEX). The GC x GC chromatograms of kerosene and diesel oil are shown on Fig.1. The X axis corresponds with the separation by the 1st column on differences in boiling point and the Y axis corresponds with the separation by the 2nd column on differences in polarity. Also, the color in the chromatograms show the

intensity of each peak The intensity increases from light blue to yellow and red. Red color shows that the compound intensity is over the setting value of maximum intensity.
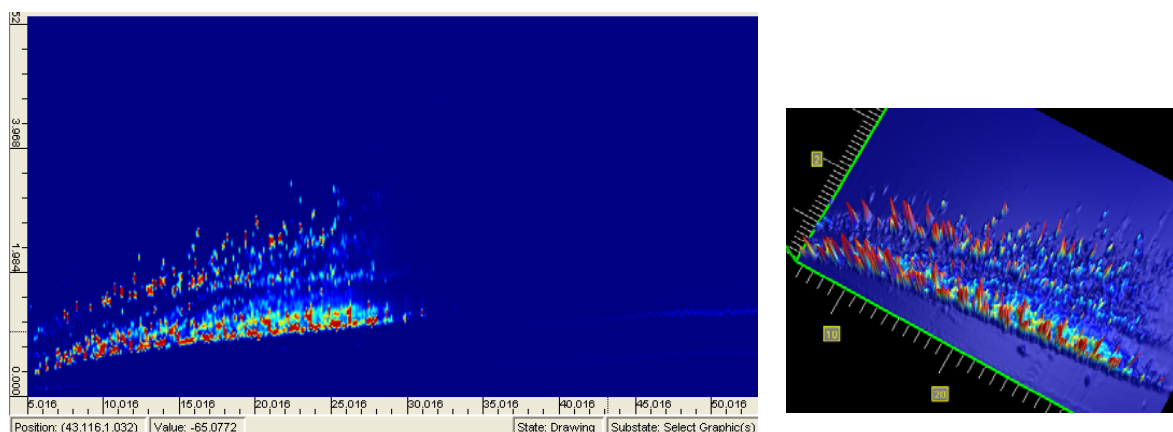

Fig.1 TICC of kerosene by GC x GC (Left: 2D image, Right: 3D image)

GC x GC can classify all of compounds in a series of saturated and unsaturated hydrocarbons. Fig.2 shows a GC x GC mass chromatogram of m/z 178 and 202 to identify tri-cyclic and tetra-cyclic aromatic hydrocarbons. Also, mass spectra of compound A and B are shown in Fig.2. Each spectrum is detected as anthracene (compound A) and pyrene (compound B).
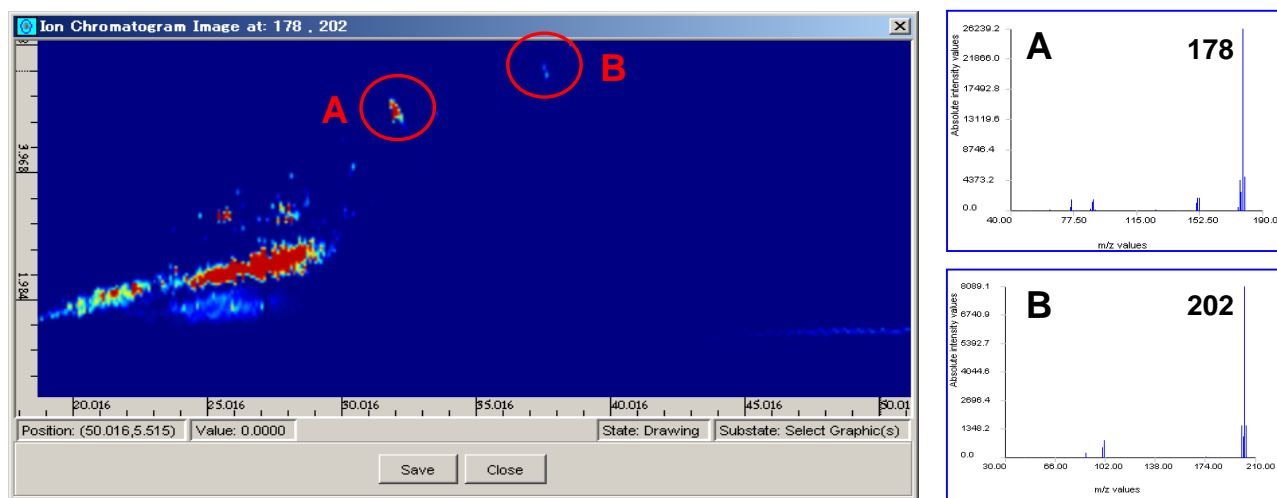

Fig.2 : GC x GC mass chromatogram of m/z 178 and 202 for polycyclic aromatic hydrocarbons and mass spectra of tri- and tetra-cyclic aromatic hydrocarbons.

The AccuTOF-GC has the capability of high speed spectrum recording to combine with GC x GC system. Furthermore, it is possible to have a good reliability with high sensitivity with high mass resolving power. Also GC x GC-AccuTOF can obtain very useful information of substances in more complicated samples such as petroleum products, perfume and environmental pollutant.

<Acknowledge>
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