SHIMADZU

Application Data Sheet

No.58

GC-MS

Gas Chromatograph Mass Spectrometer

Selective Detection Using Neutral Loss Scan in GC-MS/MS

Neutral loss scan is a measuring mode of GC-MS/MS and is used to study a class of compounds showing a common neutral molecule loss during CID (Collision-Induced Dissociation). Both Q1 and Q3 are scanned with a fixed *m/z* difference corresponding to the neutral fragment during the CID. This application datasheet presents the results from measuring PCBs in transformer oil by neutral loss scanning.

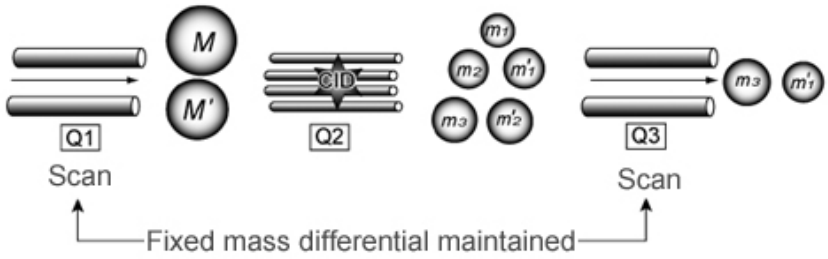

Fig. 1 Conceptual Diagram of Neutral Loss Scan Mode

Experimental

A transformer oil was diluted 1,000 times with hexane. The diluted transfer oil was spiked with three Aroclor (1242, 1252, and 1260) at a concentration of 10 ug/mL. These two solutions were analyzed in scan and neutral loss scan modes under analytical conditions (Table 1).

Table 1 Analysis Conditions

GC-MS/MS	:GCMS-TQ8030
Column	:Rxi®-5Sil MS (30 m length, 0.25 mm I.D., df = 0.25 µm)

[GC]		[MS]	
Injection temp.	: 250 °C	Interface temp.	: 250 °C
Column oven temp.	: 60 °C (1 min) → (10°C /min) → 320 °C (3 min)	Ion source temp.	: 200 °C
Injection mode	: Splitless	Tuning mode	: High sensitivity
Sampling time	: 1 min		
Flow Control Mode	: Linear velocity (40 cm/sec)	Scan Measurement	
Injection volume	: 1 µL	Event time	: 0.3 sec
		Mass range	: *m/z* 35 - 500
		Neutral Loss Scan Measurement	
		Losses of	: 35
		Collision energy (CE)	: 15 V
		Event time	: 0.3 sec
		Mass range	: *m/z* 50 - 500

Analysis Results

Figures 2 and 3 shows total ion current chromatograms (TIC) of the diluted transformer oil and Aroclor-spiked samples using scan and neutral loss scan modes, respectively. Using the scan mode (Fig. 2), the PCB peaks are hidden by the peaks of transformer oil components, which resulted in similar TIC patterns for both the diluted and spiked samples. Detecting the PCBs required confirming them via mass chromatograms for *m/z* values characteristic to their isomers. In contrast, the neutral loss scan corresponding to the mass number for chlorine at *m/z* 35 (Fig. 3) was able to selectively detect only the PCBs, without interference from the transformer oil components.

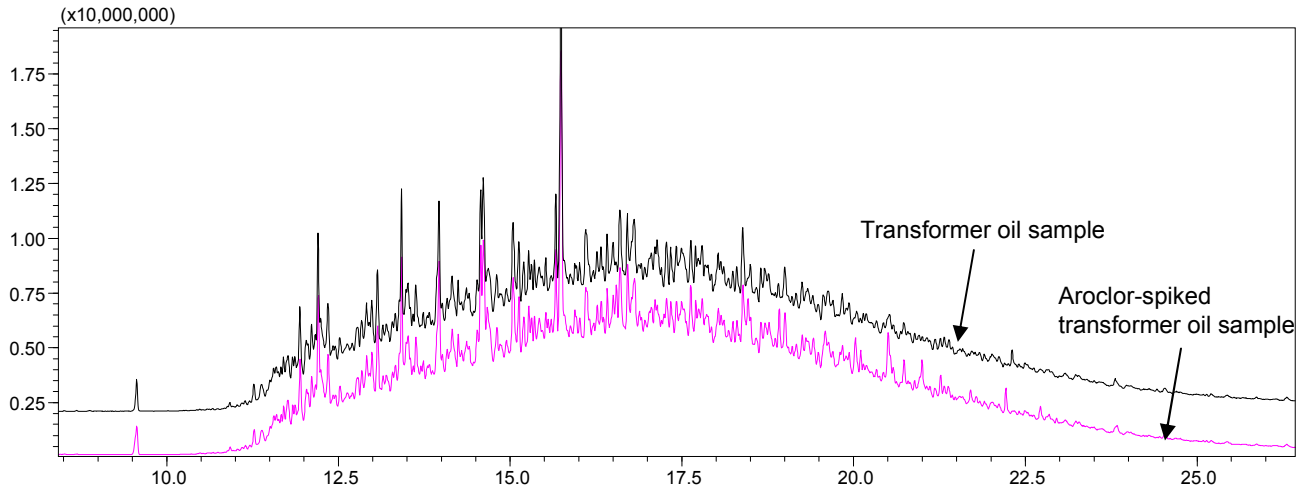

Fig. 2 Total Ion Current Chromatogram Using Scan Mode

Black: Diluted transformer oil sample prepared by diluting transformer oil 1,000 times with hexane.
Pink: Aroclor-spiked sample prepared by adding three kinds of Aroclor (1242, 1252, and 1260) at a concentration of 10 µg/mL each.

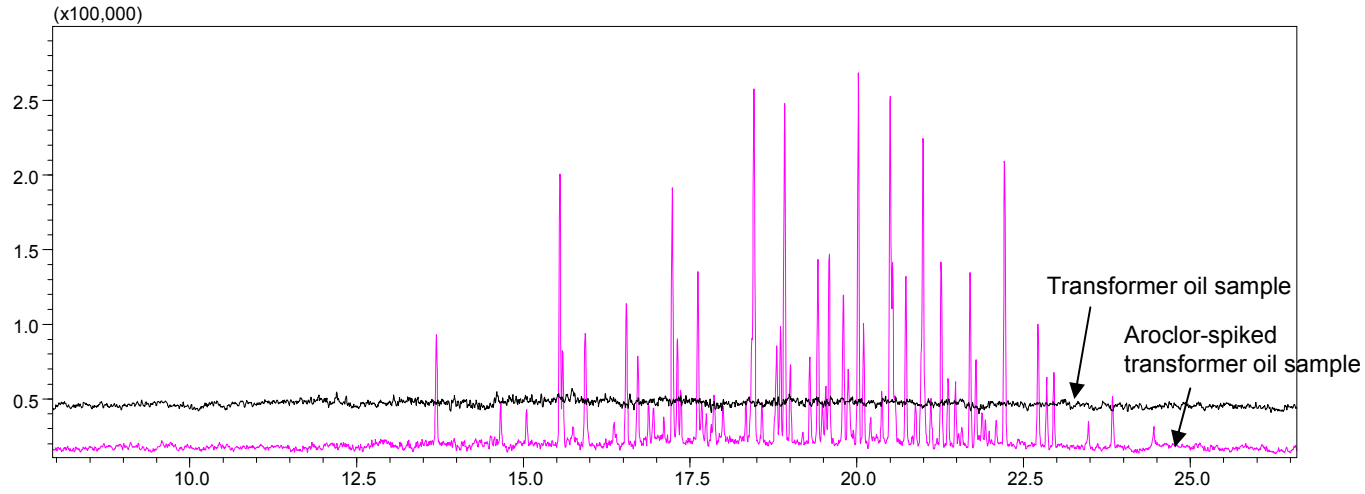

Fig. 3 Total Ion Chromatogram Using Neutral Loss Scan Mode

Black: Diluted transformer oil sample prepared by diluting transformer oil 1,000 times with hexane.
Pink: Aroclor-spiked sample prepared by adding three kinds of Aroclor (1242, 1252, and 1260) at a concentration of 10 µg/mL each.

Summary

Halogenated compounds can be selectively detected using the NCI-GC-MS method, but it requires changing the ion source. However, the GC/MS/MS neutral loss scan technique allows selective detection of halogenated compounds without changing the ion source. This method is especially useful for selectively screening for halogenated compounds in samples with large quantities of matrices, such as when measuring PCBs in transformer oil.

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