Additive analysis in lubricating oil by FD method using JMS-T2000GC AccuTOF™ GC-Alpha

Related products: Mass spectrometer (MS)

Introduction

JMS-T2000GC AccuTOF™ GC-Alpha provides advanced analysis results with high throughput by high-resolution TOFMS, multi-ionization mode, and automatic analysis software msFineAnalysis. In MSTips No. 355 , the effectiveness of the FD method in additive analysis was shown using an analysis example of bromine flame retardant in polypropylene products. In this report, we introduce an analysis example of molybdenum dithiocarbamate (MoDTC), which is a friction reducing agent for lubricating oil.

Experiment

Table 1 shows the details of the measurement conditions in this experiment. Two commercially available engine oil additives were used as samples. Sample A is 100% MoDTC, and Sample B is a product containing MoDTC.

Table 1. Measurement conditions conditions

Sample	Engine oil additive (Sample A : 100% MoDTC, Sample B : contains MoDTC)
Preprocessing	Dilute 1mg sample with 1mL chloroform
MS	JMS-T2000GC AccuTOF™ GC-Alpha (JEOL)
Ion source	EI / FI / FD combination ion source
Ionization	FD method, Cathode voltage -10kV, Emitter current 0 → 51.2mA / min → 40mA
Mass range	*m/z* 50 to 1,600

Result

From sample A , three types of MoDTC peaks with different numbers of CH were observed. From sample B, these MoDTC peaks and peaks of hydrocarbon compounds derived from the base oil were observed.

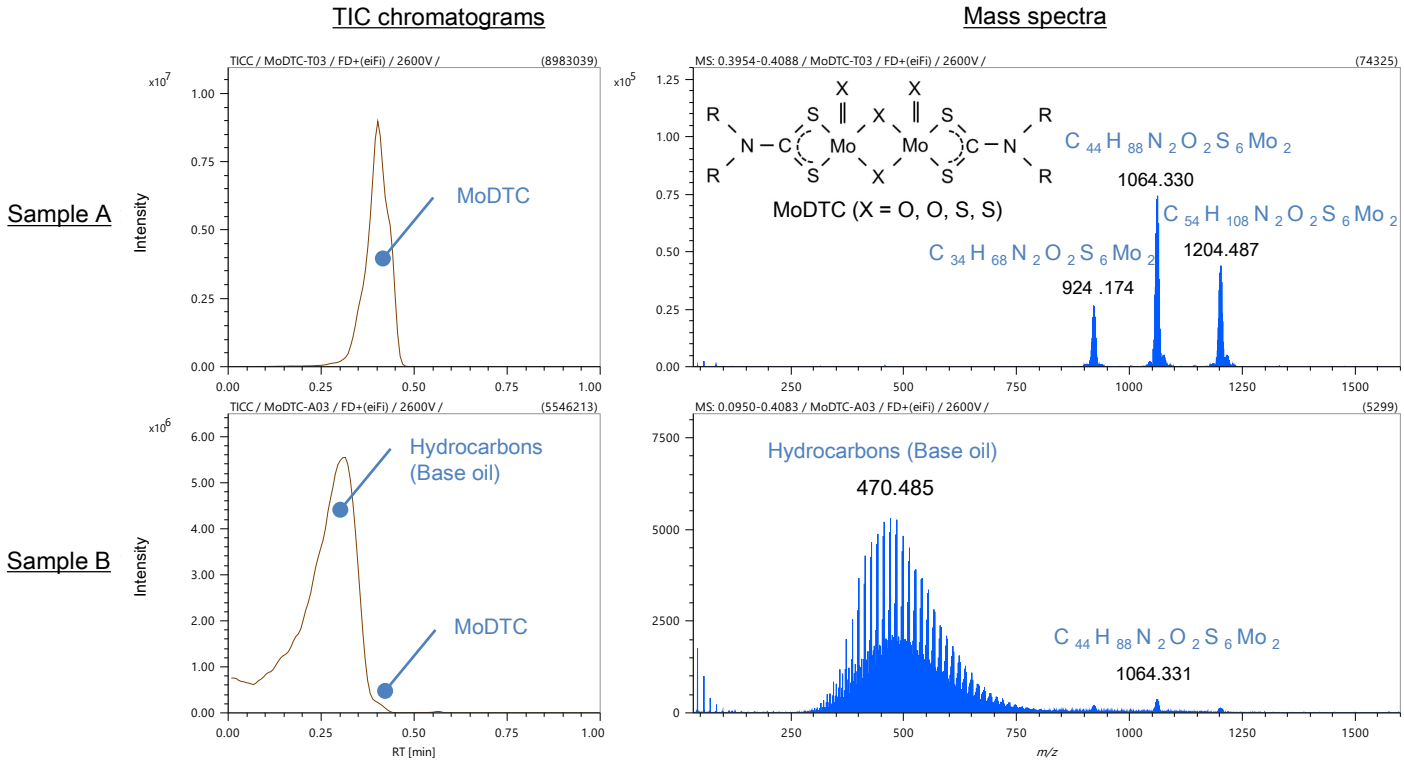

Figure 1. TIC chromatograms and m ass spectra by FD method

Figure 2 shows the measured and simulated spectra of $C_{44}H_{88}N_2O_2S_6Mo_2$. The mass error in the monoisotopic ion (about 2mDa) and the isotope pattern matching were good.

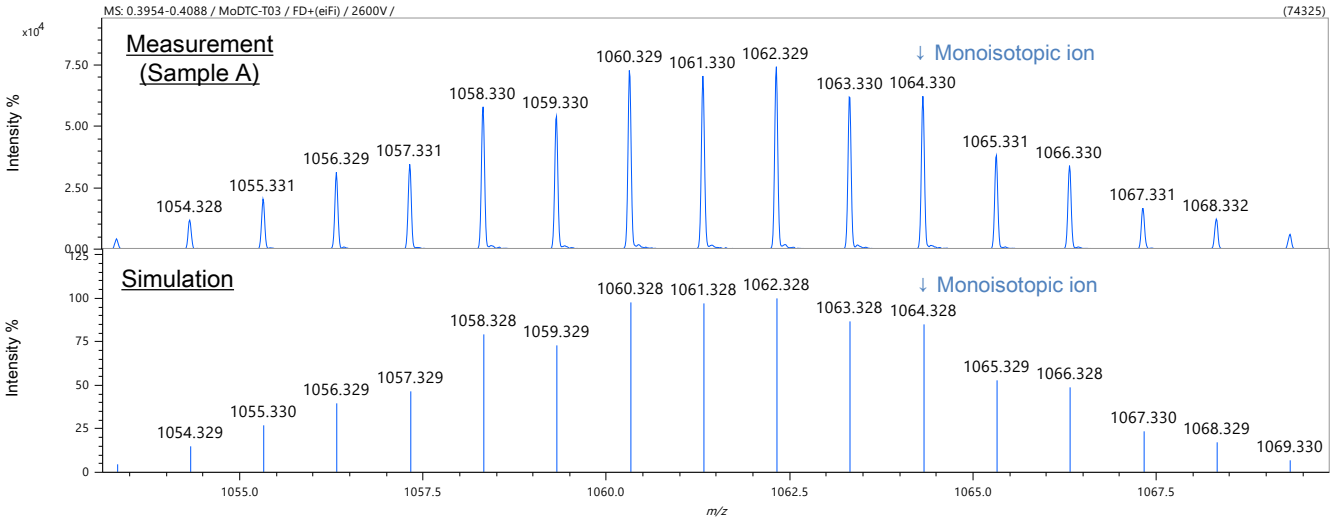

Figure 2. Mass spectra of MoDTC ($C_{44}H_{88}N_2O_2S_6Mo_2$)

Figure 3 shows the KMD plot of sample B created by msRepeatFinder . By using the KMD plot, it is possible to visualize and confirm the peaks of hydrocarbon compounds and MoDTC.

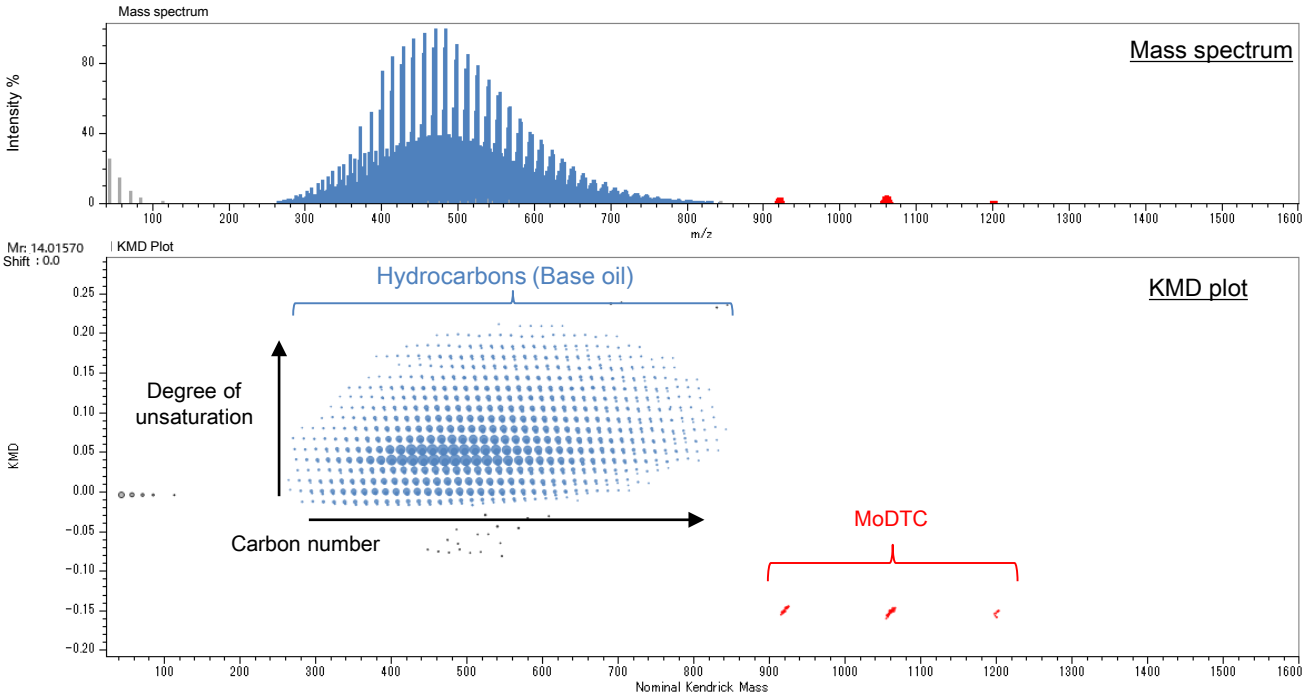

Figure 3. Mass Spectrum and KMD plot of Sample B

Summary

The FD method of JMS-T2000GC AccuTOF™ GC-Alpha can easily detect high mass components such as MoDTC . Since the FD method does not have chromatogram separation, weak peak may be overlooked in the mixture sample, but it can be visualized and confirmed by using the KMD plot of msRepeatFinder.

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