

Application Data Sheet

No.5

GC

Gas Chromatography

Analysis of Lubricant Oil Samples in Compliance with ASTM D7500 Using the Shimadzu Simulated Distillation Gas Chromatograph System

The ASTM D7500 test method describes the analysis of base stock oil and lubricant oil with an initial boiling point of 100 °C or higher and a final boiling point of 735 °C or lower (C110 or equivalent) analyzed by a simulated distillation GC system using the total area method. The Shimadzu GC-2010 Plus based simulated distillation gas chromatography system is compliant with ASTM D7500, and combines comfortable operability with high-level functionality.

This data sheet describes the simulated distillation GC analysis of lubricant oil in compliance with ASTM D7500 using the Shimadzu simulated distillation gas chromatograph.

Instruments Used and Analysis Conditions

Instruments Used

Software	LabSolutions Distillation GC Analysis Software
Gas chromatograph	GC-2010 Plus AF
On-column injection unit	OCI/PTV-2010
Auto injector	AOC-20i

Analysis Conditions

Column	UA-SIMDIS (HT) 0.53 mm × 5 m, 0.1 μm
Column temperature	35 °C - 10 °C /min - 440 °C (4.5 min)
Carrier gas flow rate	35 mL/min (helium)
Injection port temperature	100 °C - 50 °C /min - 440 °C (38.2 min)
FID temperature	450 °C
Makeup gas flow rate	30 mL/min
Hydrogen flow rate	40 mL/min
Air flow rate	400 mL/min
Injection volume	1 μL

Results

1. Analysis of Standard Solution for Calibration

Fig. 1 shows the chromatogram for the standard solution, a mixture of n-C12 to n-C-28, C-40 and Polywax655. n-C110, which has a very high boiling point, was eluted as the column temperature was rising.

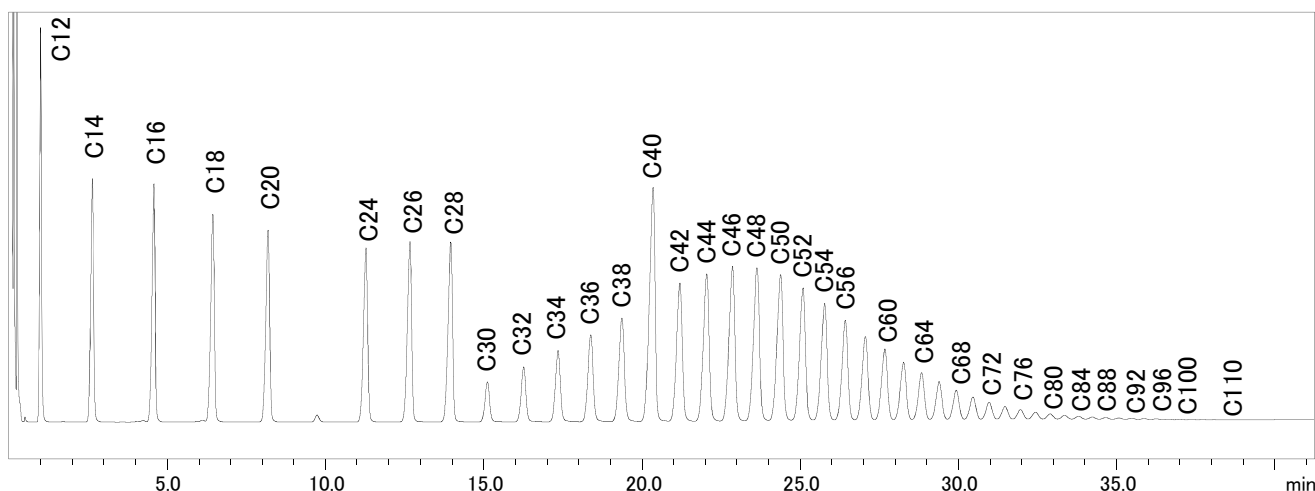


Fig. 1: Chromatogram of the Standard Solution for Calibration

2. Analysis of the Lubricant Oil Sample

Fig. 2 shows the chromatogram for the lubricant oil (used for construction equipment and drivers).

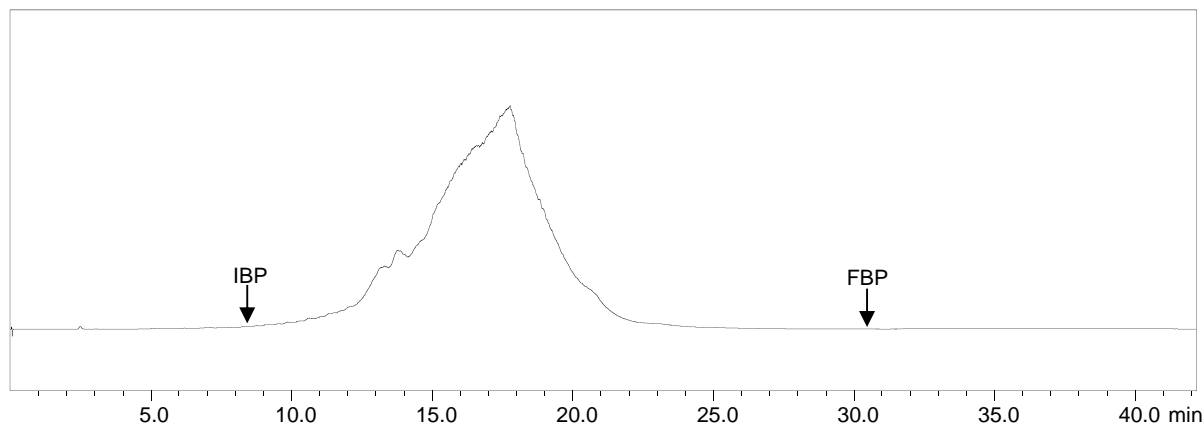


Fig. 2: Lubricant Oil Chromatogram

The reference oil 5010 was repeatedly measured five times, and repeatability was confirmed. Its chromatograms are shown in Fig. 3. The distillation characteristic curves are shown in Fig. 4. The FBP (final boiling point) relative standard deviations (RDS%) are shown in Table 1. Favorable repeatability was obtained even for the high boiling point components.

With the LabSolutions distillation GC analysis software, it is possible to display a comparison of distillation characteristics curves for up to 16 samples, simplifying everyday product data management and comparisons with previously accumulated data.

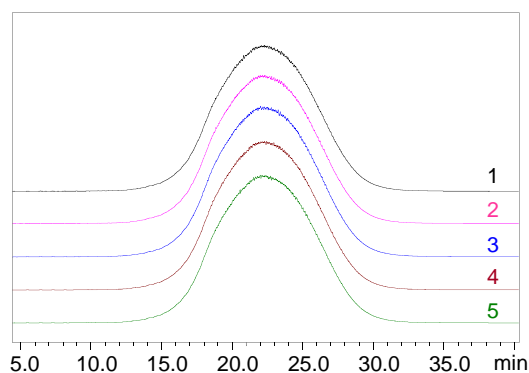


Fig. 3: Reference Oil 5010 Chromatogram

	FBP (°C)
1	643.4
2	644.4
3	642.8
4	643.1
5	643.1
Ave.	643.4
SD	0.619
RSD (%)	0.096

Table 1: FBP (Final Boiling Point) Repeatability (n=5)
Equivalent to the boiling point of n-paraffin with a carbon number of 73

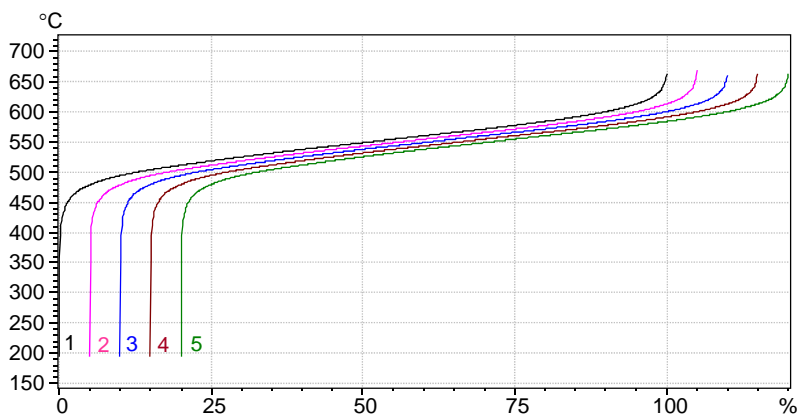


Fig. 4: Distillation Characteristics Curves
For comparison, the distillation characteristic curves have been shown shifted.