

**METHOD OF CARBON TYPE ANALYSIS OF
LUBRICATING OILS BY INFRARED SPECTROSCOPY**

Scope

This method is primarily applicable to additive-free lubricating oil base-stocks. A carbon-type analysis is obtained in terms of % C, % C_N and % C_p, being the percentages of the total number of carbon atoms in aromatic, naphthenic, and paraffinic structures respectively.

This method is limited to the ranges:

C_A 3 % - 25 %

C_p 43 % - 72 %

This method may also be utilized with additive containing oils providing it is recognized that the figures obtained will be modified by the type and quantity of additive present.

Apparatus Required

1. Double beam recording infrared spectrometer or equivalent capable of recording over the wavenumber range 4000 - 600 cm⁻¹.
2. A sample cell fitted with sodium chloride or potassium bromide windows. This can be a cell of either fixed or variable path length. In either case, the path-length should lie in the range 0.09 to 0.12 mm and be known accurately to within 0.002 mm.
3. Syringe.
4. Lens Tissue.

Materials Required

1. Two calibration oils having the following approximate values of C_A and C_p

Oil 1 C_A = 5.9 %
 C_p = 67.0 %

Oil 2 C_A = 21.5 %
 C_p = 44.0 %

Date	Action	Revisions
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Actual values will be declared on the calibration oils as supplied.

Source:

Materials Laboratory 13/100
Ford Motor Company Limited
Laindon, Basildon, Essex

Ford-Werke A.G. NU/FIL
Central Laboratory
5 K8In - Niehl

2. Chloroform (A.R.)

Conditioning and Test Conditions

All test values indicated herein are based on material conditioned in a controlled atmosphere of 23 +/- 2 °C and 50 +/- 5 % relative humidity for not less than 24 h prior to testing and tested under the same conditions unless otherwise specified.

Procedure

A. Cell Calibration

The cell path length is determined by the interference fringe method.

1. Place the empty cell in the spectrometer and select the wavenumber region to be scanned such that the maximum number of interference fringes can be counted.
2. Mark the middle of two troughs on the spectrum and count the number of interference fringes between these two points. Note the wavenumbers coincident with these points.

The cell path length is calculated as follows:

$$\text{Cell Path Length (mm)} = \frac{N \times 10}{2 (L_1 - L_2)}$$

Where N - Number of interference fringes between L_1 and L_2 .
 L_1 and L_2 = Wavenumbers between which fringes are counted.

Note: Cell Cleaning

1. After use the cell should be cleaned immediately.
2. Flush cell with approximately 20 mL chloroform
3. Evaporate chloroform with a stream of warm dry air, to avoid condensation of water on cell windows.
4. If warm air is not available, the cell may be mounted in the instrument beam so that the cell can be warmed by the infra-red radiation.