DIRECTIONS FOR TEST NO. 14-34-45

SUBJECT: Refractive Index of Liquid Aroclors

METHOD: Abbe Refractometer

Refractive Index

The refractive index of any medium is defined as the ratio of the velocity of light in air to the velocity of light in that medium. It is measured by the ratio of the sine of the incident angle to the sine of the angle of refraction. The denser the medium, the greater is the refraction toward the normal (higher refractive index). Because the refractive index is characteristic of each substance, it is useful in identifying liquids and verifying their purity, in determining the molecular structure of organic compounds, and in some quantitative analyses of mixtures. As applied to Aroclor testing refractive index provides a verification of composition and purity.

Apparatus

Abbe Refractometer with accessories, Bausch and Lomb, Cat. #2550, Serial No. 377. Calibrated to read directly in terms of refractive index of the D line (sodium) at a temperature of 20°C.

Procedure

Operators should be familiar with the Bausch and Lomb "Directions for Use" and practice the manipulation as there described before attempting determinations on Aroclor. The abridged directions below provide a working outline but at the expense of omission of essential explanatory details which are contained in the B & L directions.

Screw thermometer into its socket in water jacket of upper prism. Open prisms and check their condition. Clean if they are soiled, streaked, or spotted. With lower fixed prism horizontal, place on it 2 or 3 drops of th Aroclor from a stirring rod - sufficient to fill the spaces between prisms when clamped together. Close prisms and lock with lock nut.

Adjust the instrument and mirror to reflect white light into the refractome No spots on air pockets should be visible. Connect water jacket to source of constant temperature water, usually the tap, and pass water until the therm meter has been constant to 2.2°C. for at least 5 minutes. Record the temperature.

With prisms illuminated, rotate the prisms by means of the index arms until the border of the light and dark fields passes exactly thru the intersection of the cross hairs. If the border line is fringed with color, rotate the compensator until the color disappears. If the boundary is not sharp, adjust mirror until a distinct half shadow is obtained. If the lin the cross hairs are blurred, adjust eyepiece until a good focus is obtaine (If the line or the cross hairs are blurred, adjust eyepiece until a good focus is obtained.) Secure final fine adjustment by means of the slow moti screw.

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DIRECTIONS FOR TEST NO._____

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METHOD:_____

Read the refractive index, estimating to the fourth decimal place. If the temperature of the water jacket is other than 25°C., correct to 25° by use of the correction factor, ± 0.00044 per °C. This factor is applicable only to Aroclors 1248, 1254, 1260, and 1262. It was found by careful measurement on each Aroclor thru the range 10° to 50°C. The correction is subtracted when the working temperature is below 25°C. and added when above 25°C.

Example: If the refractive index is found to be 1.6422 at 15°C., the index corrected to 25°C. is

$$1.6422 - (10 \times .00044) = 1.6378$$

Care and Calibration of Instrument

Immediately after use, clean the prisms with swabs of pure cotton dipped in benzol, finally wiping dry with a soft cloth. The prisms, especially the upper one, tarnish and scratch easily. Consequently great care must be taken in cleaning. Before use the prisms should always be inspected and recleaned if necessary. When not in use, the refractometer should be kept in its closed case.

For practice or for checking performance, distilled water is useful. Water has a refractive index of 1.3330 at 20°C., with temperature coefficient of 0.0001. A test piece of special glass of known refractive index is supplied with the instrument for calibration and adjustment if necessary of the position of the index arm.

Refractive Index of Aroclors - Typical

Careful measurements at 25°C. have given the following typical values for Aroclors.

Aroclor 1248	1.6295
" 1254	1.6376
" 1260	1.6460
" 1262	1.6482

Substantial departures (over 0.0010) from these values should be investigated immediately as they - if correct - indicate substantial error in the composition of the Aroclor or contamination with other materials.

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