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RESEARCH DEPARTMENT - ORGANIC DIVISION

SHORT FORM REPORT

Report No. 2964

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TITLE: Cubical Coefficient of Expansion of Pyranol 1481.

INTRODUCTION:

Sales received a request for the coefficient of expansion of Pyranol 1481 from Electrical Utilities Company, LaSalle, Illinois. Research was asked to supply data for filling this request.

SUMMARY:

The coefficient of expansion of Pyranol 1481 (75% Aroclor 1254 and 25% by weight trichlorobenzene) was determined by using the density at two temperatures and calculating the coefficient from the equation

$$d_1 = d_2[1 + \alpha(T_2 - T_1)]$$

where α = coefficient of expansion

d_1 = density at temperature T_1

d_2 = density at temperature T_2

CONCLUSIONS:

Average of three determinations gives 0.000735 cc/cc/°C. as the coefficient of expansion for Pyranol 1481 over a temperature range of 25-70°C.

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RECOMMENDATIONS:

It is recommended that the Sales Department transmit these data to Electrical Utilities Company.

A. M. Ellenburg

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REFERENCE TO PREVIOUS WORK:

Phosphate Division Short Form Report 2145 - "Cubical Coefficients of Expansion of Aroclor 1260, 1268 and 1270" by B. H. Hartzog, Job No. 171-397, File No. 141-3, November 5, 1947.

EXPERIMENTAL DATA:

NB 100674 and 99761.

Density of Pyranol 1481

Test	25°C.	70°C.	α
1	1.5188	1.4697	0.000742
2	1.5193	1.4706	0.000736
3	1.5185	1.4703	0.000729
Average			0.000735

Sample Calculation

$$1.5188 = 1.4697\ [1 + \alpha(70-25)]$$

$$1.0334 = 1 + 45\alpha$$

$$45\alpha = 1.0334-1$$

$$\alpha = .0334/45$$

$$\alpha = 0.000742 \text{ cc/cc/°C.}$$

DISCUSSION:

The density of the Pyranol was determined with a pycnometer of 25 ml volume. The exact volume of the pycnometer was calibrated with water at 25°C. using the relative volume of water as reported in Lange's Handbook 7th Edition, page 1385.

At 70°C., a correction in the volume of the pycnometer was made for the cubical coefficient of expansion of pyrex glass.

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$C = V(T_V - T_O)$

C = Increase

$\alpha = 9.9 \times 10^{-6}$ for pyrex glass

V = Volume of pycnometer at 25°C.

T_V = Temperature at which volume is desired

T_O = Temperature at which volume was calibrated.

The volume at 25°C. was determined by allowing the three pycnometers to reach equilibrium at 25°C. with the capillary filled. After calibrating the volume from the weight of water, the pycnometers were filled with Pyranol 1481.

After weighing the pycnometer filled with Pyranol, the density at 25°C. was calculated from the volume of the pycnometers.

The tests at 70°C. were made by allowing the bottles to reach equilibrium in an oven. The expanding fluid was wiped off the top of the pycnometers. After six hours at 70°C., the bottles were weighed and the density calculated.

Knowing the density at two temperatures, the coefficient of expansion can be calculated. This was done on three bottles with results as reported which are consistent.

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