Density of Heptacosafluorotributylamine from 303 to 333 K

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During an investigation of the surface tension of liquid mixtures containing heptacosafluorotributylamine, $(C_4F_9)_3N$, a need arose for the density d of the substance at temperatures t between 30 and 60 °C. A pycnometric study was therefore carried out with the results shown in Table I. Koch-Light Laboratories Ltd. supplied the material which was shown, by vapor phase chromatography, to contain only perfluorinated impurities below the 1 mol % level after drying. The temperature was measured using a calibrated platinum resistance thermometer to within ±5 mK. The density values are believed to be accurate to within 0.0006 g cm^{-3}. The data are well represented over this modest range of temperature by the linear equation:

$$d/\text{g cm}^{-3} = 1.9379 - 0.002\,17(t/°\text{C}) \quad (1)$$

The only literature value for the density of $(C_4F_9)_3N$ is 1.8839 g cm^{-3} at 25 °C (*1*); our extrapolated value using eq 1 is 1.8837 g cm^{-3}.

Table I. Densities of Heptacosafluorotributylamine at Different Temperatures

t/°C	d/g cm^{-3}	t/°C	d/g cm^{-3}
29.8	1.874_1	49.0	1.830_5
34.0	1.863_1	54.0	1.819_6
39.0	1.852_3	59.9	1.808_7
44.9	1.841_4		

Literature Cited

(1) Rotariu, G. J., Hanrahan, R. J., Fruin, R. E., *J. Am. Chem. Soc.*, **76**, 3752 (1954).

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Some Physical Properties of Ten Alkanethiols as a Function of Temperature

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Dielectric constants, densities, refractive indices, and viscosities of ten alkanethiols were measured in the temperature range 0–60 °C. The experimental data for density, dielectric constant, and viscosity as a function of temperature were fitted to appropriate equations. The Kirkwood correlation factor (g) and the activation energy for viscous flow (ΔF_η) were calculated using the experimentally measured data. The value of g has been found to vary between 0.88 and 1.2 for these compounds and it decreases with decreasing temperature indicating antiparallel arrangement of dipoles at lower temperature. The value of activation energy for viscous flow (ΔF_η) increases with increasing chain length of the alkanethiols.

Physical properties of alkanethiols (RSH) are of interest as they are similar in structure to alcohols (ROH), which have been extensively studied in order to investigate the effect of hydrogen bonding. Krishnaji et al. (*6–8*) have studied dielectric relaxation behavior of alkanethiols and found that the hydrogen bonding is almost absent or too small to be detected by dielectric measurements in these compounds. The present study was undertaken to measure low frequency dielectric constants, viscosities, densities, and refractive indices of ten alkanethiols, namely, propane-1-thiol, butane-1-thiol, butane-2-thiol, 2-methylpropane-2-thiol, pentane-1-thiol, 2-methylbutane-2-thiol, hexane-1-thiol, heptane-1-thiol, octane-1-thiol, and 2-methyloctane-2-thiol in the temperature range 0–60 °C. The Kirkwood correlation factor (g) and activation energy of viscous flow (ΔF_η) were calculated using these data. The variation of these parameters with temperature and structure of alkanethiols will help understand molecular arrangement and their motion in the liquid state.

Experimental Section

The alkanethiols (97–98%) were procured from M/S Fluka AG, Switzerland, and were fractionally distilled before use. The