226. *Ethyl Palmitate. Its Density, Surface Tension, Parachor, and Eötvös–Ramsay–Shields Coefficient.*

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THE scanty data available for the calculation of the parachor of long-chain substances seem to show that values calculated by means of Sugden's atomic and structural constants (J., 1924, **125**, 1177) are consistently too low, better agreement being obtained when these constants are modified as suggested by Mumford and Phillips (J., 1929, 2112).

The density and surface tension of pure ethyl palmitate have therefore been determined with a view to provide additional data. The mean value of the parachor obtained for this substance is 785·7 ; this is 1·25% higher than the value given by the later constants and 3·11% higher than would be expected from Sugden's constants.

The value of the Eötvös–Ramsay–Shields constant is -3.45, which is higher than the mean value of -2.12. Similarly high values are, however, usual for substances of this type, e.g., k for amyl stearate is -3.82 (Morgan and Kramer, *J. Amer. Chem. Soc.*, 1913, **35**, 1834).

<div align="center">E X P E R I M E N T A L.</div>

Ethyl Palmitate.—This was prepared from Kahlbaum's purest palmitic acid by the Fischer and Speier method of esterification. It was purified by repeated fractional distillation at a few mm. pressure from a quartz flask through a short (10 inch) column; the fractions were collected in a Bruhl receiver. After several crystallisations from acetone at 0°, the ester had m. p. 24·1° (Beckmann method) and 25·0° (capillary tube). Smith (J., 1931, 802) gives 24·18° and 25° respectively, and Francis, Piper, and Malkin (*Proc. Roy. Soc.*, 1930, **128**, *A*, 217) give 25° (capillary tube).

Density and Surface-tension Determinations.—Surface tensions (γ, dynes/cm.) were determined by the method of maximum bubble pressure (Sugden, J., 1922, **121**, 858; 1924, **125**, 27), and densities (g./c.c.) with a U-shaped pyknometer (J., 1924, **125**, 1171).

Temp.	$D_4^{t°}$.	Temp.	$D_4^{t°}$.	Temp.	γ.	Temp.	γ.
22·0°	0·8598	78·0°	0·8177	22·0°	31·54	61·5°	27·42
27·2	0·8561	80·0	0·8164	25·0	31·10	70·1	26·89
34·0	0·8509	95·1	0·8046	28·4	30·30	80·3	25·76
40·7	0·8459	111·7	0·7935	29·7	30·46	90·5	25·31
47·5	0·8411	121·9	0·7856	30·2	30·34	100·7	24·25
54·5	0·8362	142·5	0·7698	34·8	29·97	111·0	23·06
61·0	0·8305			40·1	29·24	126·5	21·98
				46·2	28·91	142·0	21·11
				53·4	28·32	146·0	20·42

Parachor.—The above data were plotted (see below), and values taken from the curves were used in calculating the parachor, $P = M\gamma^{\frac{1}{4}}/(D - d)$. The density of the vapour, d, being very small, was neglected.

Temp.	$D_4^{t°}$.	γ.	P.	Temp.	$D_4^{t°}$.	γ.	P.
22°	0·8598	90°	0·8087	31·54°	783·6	25·17	787·4
30	0·8538	110	0·7941	30·34	781·6	23·46	787·9
50	0·8388	130	0·7794	28·63	784·1	21·74	787·7
70	0·8237	140	0·7718	26·91	786·1	20·87	787·4

<div align="center">Mean value of parachor 785·7.</div>

Eötvös–Ramsay–Shields Coefficient.—This was calculated from the above figures by using the usual formula : the mean value was -3.45.

Temp. range	30—50°	·70—90°	110—130°
k	-3.25	-3.50	-3.60

The graph of density against temperature is linear over the range covered, but that of surface tension shows a break at about 30° (see fig.).
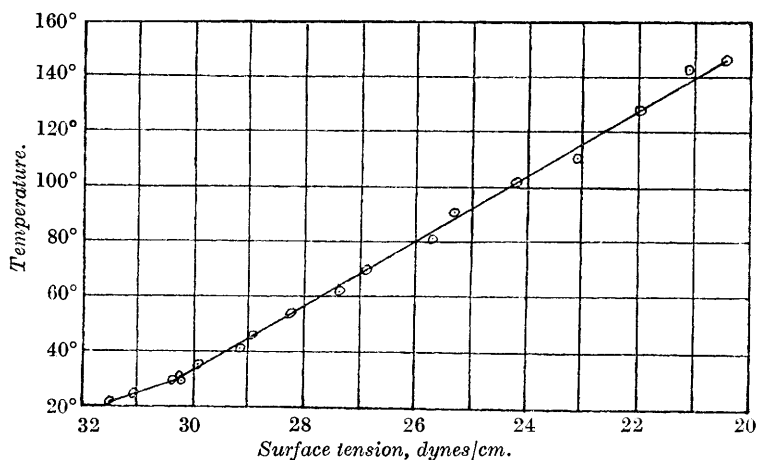
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