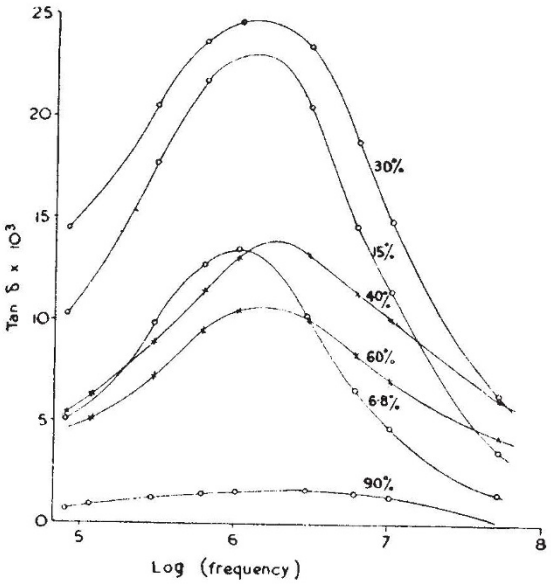

Dielectric absorption at 20° C. for a range of concentrations of laurone in *n*-hexacosane

In order to investigate the effects of dipolar interaction, it seemed desirable to make dielectric measurements with mixtures containing a gradually increasing proportion of polar molecules. The accompanying graph shows the frequency / tan δ relationships for a series of concentrations of the ketone, laurone ($C_{23}H_{46}O$), in a non-polar solvent, *n*-hexacosane. The measurements were made at 20° C., and cover the frequency-range, 60 kc./s. to 50 Mc./s. It is seen that the dielectric loss at first increases with increasing concentration but later decreases, pure laurone giving negligible loss within this range.

With concentrations up to at least 15 per cent, the majority of the laurone molecules are probably surrounded by non-polar solvent. The rapid increase of the maximum tan δ with concentration in this range suggests that solute molecules thus situated are able to perform rotational transitions leading to dielectric absorption in an alternating electric field. A small proportion of the ketone molecules, however, occupy adjacent positions in the crystal lattice, and the resulting dipole interaction probably causes a very high energy difference, V, between equilibrium positions. The probability of finding such molecules in a higher equilibrium position is thus small, and they therefore contribute little to the polarization. As the concentration of laurone increases, the proportion of adjacent molecules increases rapidly, the effect on the polarization being indicated by the dielectric absorption results given. It is probable that pure crystalline laurone provides an example of the type treated theoretically by Fröhlich[5], in which, even at room temperature, $kT \ll V$, and there is no dielectric loss of the Debye type. Similar results were obtained with the ketones, myristone ($C_{27}H_{54}O$), palmitone ($C_{31}H_{62}O$), stearone ($C_{35}H_{70}O$) and 22-tritetracontanone ($C_{43}H_{86}O$).

In contrast to the ketones, several long-chain esters gave strong absorption of the Debye type. The maximum tan δ and frequency values for three such compounds are given in the accompanying table.

Ester	Tan δ (max.)	Frequency (max.)
Dodecyl laurate, $C_{24}H_{48}O_2$	$1{\cdot}4 \times 10^{-2}$	3 Mc./s.
Dodecyl myristate, $C_{26}H_{52}O_2$	$4{\cdot}0 \times 10^{-2}$	600 kc./s.
Cetyl palmitate, $C_{32}H_{64}O_2$	$1{\cdot}5 \times 10^{-2}$	100 kc./s.

Thus, with these esters, the energy difference between equilibrium positions is probably less than in the ketones of corresponding chain-length, and a significant proportion of the molecules are to be found in the second position. This suggests that dipole interaction in the esters is less than in the corresponding ketones.

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Potassium and Neuromuscular Transmission

In a study of the effects of ions on the rat diaphragm, it has been found that denervated preparations are much more sensitive to potassium than the normal diaphragm stimulated through its nerve. A dose of potassium, for example, exposure to a concentration of 0·08 per cent in Krebs's solution, which has no depressant action on normal muscle, may completely depress the response of denervated muscle to electrical stimuli while its response to acetylcholine remains. Observations have now been made on diaphragms denervated functionally by curare, which prevents the action of acetylcholine, or by lack of glucose, which prevents its synthesis or release. The effect is the same in both cases. If now, however, the experiment is reversed and the potassium added first, it is found that after curare, or through lack of glucose, which abolish neuromuscular transmission, the muscle has become inexcitable. The exact cause of this somewhat dramatic finding is not certain.

An obvious suggested explanation of these facts might be that potassium and curare have a synergic action, or that acetylcholine and potassium oppose each other. Another explanation would be that the potassium does, in fact, render the muscle inexcitable to direct stimulation in all cases, but it can remain excitable to nerve stimulation only. This explanation is supported by preliminary observation that, although after potassium the muscle contracts normally, its resting potential is reduced by one third, as shown also by Boyle and Conway[1], and its action potential is negligible. This latter observation is in accordance with that of Brown and Euler[2], that action potential may be reduced by potassium while the muscle tension is increased.

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