Fig. 2 shows another example: it is suggested that this whisker with a scale-like construction refers to spirals[6].

The zig-zag pattern in Fig. 3 indicates that the two-dimensional explanation of S. Amelinckx[9] of the helically twisted silver whiskers observed by Brenner[10] refers to a two-dimensionally twisted whisker shape which actually exists.

We wish to thank Miss F. Jost for her help.

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## Effect of Strong Electric Fields on the Boiling Points of some Alcohols

WHILE investigating the molecular theory of liquids and liquid mixtures we were led to examine the effect of strong electric fields on the saturation vapour pressures (boiling points) of liquids. Results of these investigations for methyl, ethyl and *iso*propyl alcohols are reported here.

The liquid is in a cylindrical tube about 20 cm. long which is immersed in a transformer oil bath. A condenser, fitted to the side of the tube through a ground-glass joint, keeps the boiling liquid in contact with the outside atmosphere while at the same time vapours condense and flow back into the liquid without escaping out of the apparatus. A Beckmann thermometer, graduated in hundredths of a degree centigrade, is inserted from the upper end of the tube and held vertical with its bulb just above the surface of the boiling liquid. When the liquid is boiling the bulb remains completely covered with a continuous film of the liquid formed by the condensing vapours which trickle back into the liquid in the form of drops. A built-in condenser is provided near the upper end of the tube to prevent any possible leakage of vapours through the upper portion. A regulated supply of heat to the oil bath is given by an electric heater controlled by a 'Variac' transformer. The temperature of the oil bath is maintained a few degrees above the boiling point of the liquid. Under these conditions the boiling point could be maintained constant to 0·01 deg. C. for fairly long intervals.

The tube containing the boiling liquid and its vapours is held between two parallel metal plates to which an alternating voltage of about 20 kV. can be applied through a transformer.

Samples of pure specimens used in the present investigations were Merck's analytical reagents from freshly opened bottles which were further purified by the usual methods until their boiling points and densities agreed with those quoted in the literature. The liquid was allowed to boil first in the absence of the field, and after the temperature remained steady for about $\frac{1}{2}$ hr. the field was switched on. The temperature starts falling almost immediately and becomes steady after some time. On switching off the field the boiling points rose to their original values.

The depression in the boiling points, $\Delta T$, for fields $E$, varying from 0 to 5 kV./cm., were determined for methanol, ethanol and *iso*propanol.

Observations were also made with three different tubes $A$, $B$ and $C$ of diameters 3·65 cm., 3·00 cm. and 2·50 cm. respectively. These are shown in Table 1.

Table 1. DEPRESSIONS IN THE BOILING POINTS OF METHANOL ETHANOL AND *ISO*PROPANOL IN ELECTRIC FIELDS

| Applied voltage (kV./cm.) | $\Delta T$ (°C.) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Methanol | | | Ethanol | | | *Iso*propanol | | |
| | $A$ | $B$ | $C$ | $A$ | $B$ | $C$ | $A$ | $B$ | $C$ |
| 0·00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2·36 | 0·68 | 0·70 | 0·80 | — | — | — | — | — | — |
| 2·89 | 1·05 | 1·08 | 1·10 | 0·32 | 0·34 | 0·35 | — | — | — |
| 3·42 | 1·25 | 1·29 | 1·40 | 0·40 | 0·43 | 0·45 | 0·20 | 0·20 | 0·23 |
| 4·00 | 1·80 | 1·87 | 1·90 | 0·60 | 0·65 | 0·64 | 0·25 | 0·26 | 0·26 |
| 5·00 | 2·00 | 2·00 | 2·10 | 0·70 | 0·72 | 0·76 | 0·40 | 0·42 | 0·42 |

However, when the field was applied only to the liquid region and not to the vapour phase, a rise of 0·1 deg. C. was observed in the case of methanol at 5 kV./cm.

Observations with other polar as well as non-polar liquids are in progress.

We wish to thank Prof. D. S. Kothari for suggesting the problem and helpful discussions. One of us (M. M. C.) is grateful to the Council for Scientific and Industrial Research for financial assistance.

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## Thermo-Reversible Denaturation of Eucollagen in Solution

A SUBSTANTIAL proportion of mature collagenous tissue will dissolve in weakly acidic media after a cold pre-treatment in alkali. The resulting solutions of soluble eucollagen show qualitatively many of the characteristics of solutions of acid-soluble collagens[1]. In particular, a very dilute solution in 0·15 $M$ citrate ($p$H 3·7) possesses a high specific viscosity ($\eta_{sp}/C$ about 10 dl./gm. at $C = 0{\cdot}02$ gm./100 ml.) over the temperature range 5–25° C., and a very much lower value ($\eta_{sp}/C$ about 0·4 dl./gm.) at 35° C. and higher temperatures. The high viscosity at low temperatures suggests that eucollagen, like collagen, has a rigid, rod-like form in solution, while the relatively low viscosity at 35° C. and higher temperatures reflects the very flexible nature of the gelatin molecules which are formed rapidly and irreversibly under such conditions from the eucollagen solution.

At intermediate temperatures (for example, 30° C.) the initially high viscosity falls with time, and on re-cooling to 20° C., the solution shows a marked and rapid rise in viscosity. Examples are given in Fig. 1. Boedtker and Doty[2] have stated that solutions of soluble collagen, after partial denaturation by heating, show an increase in viscosity on re-cooling, and have suggested that this is due to aggregation of the gelatin molecules previously formed