

It can thus be said in a general way that the smaller capacities would be required for the higher frequencies and *vice versa*. The different motors having armatures of different inductance and self-capacity would, of course, require different values of capacity for minimum noise, even for the same frequency.

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April 17, 1943.

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X-RAY DIFFRACTION STUDY OF CYBOTAXIS AT THE INTERFACE

THE structure of liquid in the interior may be taken as vaguely ordered statistical swarms of molecules, or it may be looked upon as a three-dimensional *quasi-crystalline* structure of ordered molecules, with molecules obeying gaseous laws in the interspaces, so that the composite arrangement shows both ordered and disordered properties simultaneously. The interface between two liquids, or between a liquid and a gas is, however, a region of permanently oriented molecules. The purpose of this note to study the nature of the interface structure, by X-ray diffraction method. For this purpose $\text{CuK}\alpha$ radiation, filtered through nickel was allowed to strike the liquid-air interface. The beam was extremely narrow and about 2 mm. in diameter. It passed grazing the interface, with its lower edge just inside the liquid, so that the pattern of the liquid in bulk, may not come out with great prominence. The photographed diffraction pattern was microphotometered and the *intensity* \rightarrow *interplanar spacing curve* was drawn. Fourier analysis of the main peak was done according to the method of P. Debye and H. Menke.¹ This gave the atomic distribution curve of the atoms, about any atom in the liquid, and for methyl alcohol, the atomic distribution curve showed maxima at 1.57, 2.94, 4.23, 5.64 Å, at 20° C. and at 1.63, 2.98, 4.36, 5.75 Å at 40° C. The peak at 1.57 Å is interpreted as arising from $(\text{CH}_2\text{OH})_2$; that at 2.94 Å, as arising from $(\text{CH}_2\text{OH})_3$; that peak at 4.36 Å has its origin in (CH_2OH) and the last peak is due to oriented molecules at the interface. Values of integrated intensities under the peaks are proportional to the relative number of molecules of the different species. With a fixed arrangement the integrated area under the last peak does not vary with temperature; while the relative integrated areas under the first three peaks change considerably with temperature. Assuming the number of triple molecules as small, the ratio of the polymers with 1 and 2 molecules, as obtained from the above analysis of the diffraction pattern, comes out as 0.25 and 0.20, at 20° and 40° C. respectively. The same values calculated from association factor ' α ' are 0.220

and 0.163 at the two temperatures mentioned ($\alpha = 1.82$ at 20° C. and 1.86 at 40° C.).

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March 30, 1943.

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1. P. Debye and H. Menke, *Phys. Zeits.*, 1930, 31, 797.

PREPARATION OF SUB-IODIDES OF CADMIUM AND ZINC

WOEHLER AND RODEWALD¹ prepared calcium sub-iodide in 1904. Preservation of sub-iodides is difficult. Samuel and Zakiuddin² succeeded in preserving calcium sub-iodide under carbon disulphide for some time. Kupfer³ found that the compound could be preserved for a fairly long interval in parafin and he studied X-ray diffraction of the sub-iodide.

Employing the method suggested by Samuel and Zakiuddin, the sub-iodides of cadmium and zinc have been successfully prepared by the author of the note. Iodine and cadmium of C.P. quality were taken in the ratio of their equivalent weights and placed in a steel bomb provided with an air-tight screw. The bomb was heated in an electric furnace to about 1000° C. for 10 hours and cooled suddenly by immersion in water. The resulting greenish yellow powder was found, on chemical analysis, to be cadmium sub-iodide. It could be preserved for over a week under carbon disulphide. Zinc sub-iodide, prepared in a similar way and easily preserved under carbon disulphide, was black in colour.

Absorption spectra of these sub-halides will be studied later.

Meteorological Office,
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February 13, 1943.

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1. Woehler and Rodewald, *Z. f. anorg. Chemie*, 1904, 61, 54. 2. Samuel, R., and Zakiuddin, *Proc. Ind. Acad. Sci.*, 1935, 1, 723. 3. Dr. Kupfer, Private Communication to Dr. Zakiuddin, 1936.

A NEW PHOTOMETRIC METHOD FOR THE ESTIMATION OF TOCOPHEROL (VITAMIN E)

PAUL MEUNIER AND ANDREE VINET¹ pointed out that a solution of α -tocopherol in alcohol (a few γ) when mixed with a reagent composed of one drop of a 1 per cent. solution of potassium ferricyanide and one drop of 1.5 per cent. solution of ferric chloride mixed with 1 c.c. chloroform and made up to 10 c.c. with absolute alcohol, developed a blue colour. Experiments were conducted to find out the suitability of this colour production as a photometric method for the estimation of tocopherol in oils.

A standard solution of α -tocopherol in absolute alcohol was prepared by methyl-alcoholic alkali saponification of α -tocopherol acetate according to the method of Emmerie.² The solution was standardised by the FeCl_2 - $\alpha\alpha'$ -di-

pyridyl method of Emmerie and Engel³ using absolute alcoholic solutions of the reagents and the Pulfrich photometer with S. 50 filter and 1 cm. cell. During these estimations it was found that more consistent and reproducible results could be obtained by using a mixture of the solutions of ferric-chloride and *aa'*-dipyridyl for colour development rather than by using them one after another. The mixed reagent can be prepared by dissolving 16 mg. ferric-chloride and 20 mg. *aa'*-dipyridyl in 16 c.c. pure absolute alcohol, and using 2 c.c. of this every time for the blank and the experimental. According to this procedure α -tocopherol upto 100 γ can be estimated.

THE FERRIC CHLORIDE-POTASSIUM FERRICYANIDE REACTION

A standard graph (Fig. 1) showing the relationship between the content of α -tocopherol and the extinction coefficient was drawn. The intensity of the colour is proportional to the extinction coefficient and obeys Beer's law and the colour is stable over long periods. In all these estimations the colour was developed in 10 c.c. flasks. Filter S.72 and 1 cm. cells were used. The minimum quantity of the reagents were found out to be 0.4-0.5 c.c. of each of 0.4 per cent. ferric-chloride and 0.25 per cent. potassium ferricyanide solution up to 100 γ of α -tocopherol.

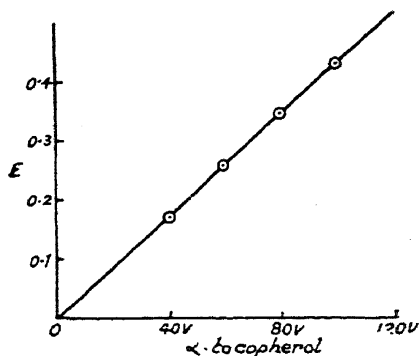


FIG. 1

FeCl_3 , K_3FeCN_6
10 cm., 31 cm. cell
(S. 72)

The reagent should be prepared fresh before each estimation by mixing together 0.5 c.c. of 0.4 per cent. FeCl_3 solution and 0.5 c.c. of 0.25 per cent. potassium ferricyanide solution adding 1 c.c. pure chloroform and making up to 11 c.c. with purified absolute alcohol (free from reducing substances). 5 c.c. of this reagent is used for blank and experimental. The reagent deteriorates rapidly and assumes a dark colour especially in the presence of light.

For the standardisation, known amounts of α -tocopherol in alcoholic solution were taken and the extinction coefficient was measured after developing the blue colour. Measurements can be made immediately after the reaction. A blank should be prepared every time.

Experiments were conducted with wheat germ oil saponified by methyl alcoholic KOH. The values (Table I) for the tocopherol content as estimated by the FeCl_3 - $\text{K}_3\text{Fe}(\text{cy})_6$ method

agree well with those determined by *aa'*-dipyridyl method.

TABLE I

Vol. of solution in absolute alcohol	<i>aa'</i> -dipyridyl method		$\text{K}_3\text{Fe}(\text{cy})_6$ method	
	Ext. coefficient	γ α -tocopherol	Ext. coefficient	γ α -tocopherol
0.2 c.c.	0.097	28	0.125	29
0.4 c.c.	0.210	57.5	0.250	58
0.6 c.c.	0.315	85	0.370	85

It is clear from the above table that the extinction coefficient for the same concentration of α -tocopherol is greater by the $\text{K}_3\text{Fe}(\text{cy})_6$ method than by the *aa'*-dipyridyl. A wheat germ oil solution in purified petroleum ether, when treated by the method of Parker and McFarlane⁴ also gave similar results though as pointed out by McFarlane, the values were slightly higher than those obtained when the oil was saponified with alkali.

A pharmaceutical preparation (Ephynal, Roche) containing α -tocopherol acetate also gave concordant results by both methods [*aa'*-dipyridyl and $\text{K}_3\text{Fe}(\text{cy})_6$].

The tocopherol content of some vegetable oils by this method [$\text{K}_3\text{Fe}(\text{cy})_6$] is being investigated.

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May 1, 1943.

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1. Paul Meunier and Andree Vinet, *Comptes rendus*, 1940, 211, 611-13. 2. Emmerie, *Rec. trav. chim. pays. Bas.*, 1940, 59, 246-48. 3. Emmerie and Engel, *Ibid.*, 1938, 57, 1351-58. 4. Parker and McFarlane, *Can. J. Res.*, 1940, 18, B. 405.

SYNTHESIS OF NEW ANTIMALARIALS RELATED TO ATEBRIN, PART I

In atebirin, the side chain (I), viz., δ -diethyl-amino- α -methyl-butylamine is attached to the carbon atom in position 5 of the acridine nucleus. It is interesting to note¹ that the nature of the aliphatic side-chain in position 5 of the 2-chloro-7-methoxy acridine plays a very important role in determining the chemotherapeutic index of various compounds of this series. The change from $\text{NH}(\text{CH}_2)_4\text{NET}_2$ to $\text{NH}(\text{CH}(\text{Me})(\text{CH}_2)_3\text{NET}_2$ reduces the index from 20 to 6.6, whilst that from $\text{NH}(\text{CH}_2)_3\text{NET}_2$ to $\text{NH}(\text{CH}(\text{Me})(\text{CH}_2)_2\text{NET}_2$ raises the value from 6 to 15. It was, therefore, considered desirable to study the effect of different alkyl groups when introduced in position β , γ and δ of the side chain (I), on the antimalarial activity of the resulting compounds.

With this object in view, in this part, acridine derivatives (VIII), (IX) and (X) containing alkyl groups (R = Me, Et and isopropyl) in the β -position of the side chain, have been prepared as follows: