

Quenching of Fluorescence by Nitric Oxide

It is known that the fluorescence of many hydrocarbons and particularly of the polycyclic hydrocarbons in solution is often strongly quenched by molecular oxygen^{1,2}. We have now investigated several other gases with regard to their quenching effect towards polycyclic hydrocarbons.

Carbon monoxide and nitrous oxide are without any measurable effect. On the other hand, nitric oxide, which in many respects resembles molecular oxygen, shows a strong quenching of the fluorescence of, for example, anthracene, benzpyrene or methylcholanthrene in various solvents, such as hexane, ethanol, etc. The effectiveness of a particular solvent again depends primarily on the solubility of nitric oxide in it. As in the case of oxygen, this quenching effect is completely reversible if the nitric oxide is replaced, for example, by pure nitrogen. This can again be taken as some evidence for a reversible oxidation and reduction system in these cases².

Just as in the case of oxygen, where it is possible to obtain the photochemical formation of a peroxide under suitable conditions, prolonged ultra-violet irradiation of these hydrocarbon solutions in an atmosphere of nitric oxide probably leads to the formation of what may be termed nitroxides (C_nH_mNO) analogous to the peroxides ($C_nH_mO_2$).

It seems that these nitroxides are even less stable than the peroxides and cannot usually be separated as such, but we have obtained several crystalline nitrogen-containing compounds, as a result of the photochemical reaction, which are presumably products of secondary irreversible changes of the primarily formed nitroxides.

A full account will be published elsewhere.

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¹ Bowen, E. J., and Williams, A. H., *Trans. Faraday Soc.*, **35**, 765 (1939).

² Weil-Malherbe, H., and Weiss, J., *NATURE*, **149**, 471 (1942).

Determination of the Water Content of Wood and other Substances by means of Ternary Azeotropic Mixtures

It is peculiarly difficult to dry certain substances and to determine the water in them because (a) if liquids they may form inconvenient mixtures of constant boiling point (azeotropic) with water, (b) if solids they may retain water of crystallization, form syrups, or be susceptible to oxidation, or (c) their structure and colloidal state may hinder the loss of water, as in wood, peat, etc. One well-known method is to distil after adding a liquid immiscible with water; the distillate settles into two layers and the volume of water is measured.

Young and Fortey¹ used fractional distillation for quantitative analysis of liquid mixtures and

obtained anhydrous ethyl alcohol by distillation with benzene. All water is removed in the ternary azeotropic mixture which boils at 64.85°, and has 74.1 per cent benzene, 18.5 alcohol and 7.4 water. The alcohol benzene binary boils at 68.24°. With this procedure Atkins and Wilson² obtained anhydrous solids, levulose, maltose and starch, suspended in benzene.

The method can be used for quantitative determination of water in a solid, since the anhydrous alcohol abstracts the water which distils over in the ternary. Conditions laid down by Young³ for liquid mixtures should be observed, and accuracy checked using known weights of water. Disappearance of turbidity in the condenser indicates the complete removal of this addition. Accuracy is increased by the fact that the ternary mixture weighs more than thirteen times as much as the water in it. Other ternary mixtures contain even less water. Hill⁴ obtained one boiling at 61.8° and consisting of carbon tetrachloride 86.3, alcohol 10.3 and water 3.4 per cent; the corresponding binary boils at 65.2. Atkins⁵ found one boiling at 65.7 with carbon tetrachloride 76.9, methyl-ethyl-ketone 20.1 and water 3.0 per cent. The binary boils at 73.8°, giving good separation. Both ternaries are less inflammable than the one with benzene. They are also more sensitive, since they weigh, respectively, more than twenty-nine and thirty-three times as much as their water content. An eight-section Young evaporator still head was used throughout.

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¹ Young, S., and Fortey, E. C., *J. Chem. Soc.*, **81**, 752 (1902).

² Atkins, W. R. G., and Wilson, E. G., *J. Chem. Soc.*, **107**, 916 (1915).

³ Young, S., "Fractional Distillation" (London, 1903).

⁴ Hill, T. H., *J. Chem. Soc.*, **101**, 2467 (1912).

⁵ Atkins, W. R. G., *J. Chem. Soc.*, **117**, 218 (1920).

Onset of Fibrillation in Denervated Muscle

RECENT studies of the phenomenon of fibrillation in denervated muscle have shown that it is subject to considerable variation. Since this phenomenon is becoming of increasing importance in the diagnosis and prognosis of nerve injuries, we feel that the following observations should be recorded.

We have found that, in laboratory mammals and man, fibrillation invariably occurs provided the denervated muscle is maintained at body temperature. We have found, also, that the time of onset of fibrillation following denervation of voluntary muscles varies according to the size of the mammal. In the mouse, fibrillation commences 3½ days after nerve section; in the rat 4½ days; in the rabbit (small) 6 days, (large) 8 days; in the monkey (*Mac. mulatta*, small adult) 8 days, and in man (11 stone) 18 days. These differences may be related to the metabolic level, for we have observed that the onset in thyroidectomized rabbits is delayed until the fourteenth day. In the light of these observations, muscles in man have been investigated by means of electromyography following peripheral nerve injuries. It has been found possible to record fibrillation following denervation, partial or complete, if the lower motor neurone is divided anywhere between the anterior