Fig. 3. Plot of percentage transmission against λ for methyl red (80 mg/l.) in N/100 hydrochloric acid (curve 1), in water (curve 2) and in N/100 sodium carbonate (curve 3)

Fig. 4. Plot of percentage transmission against λ for disulphine blue VN 150 (80 mg/l.) in N/100 hydrochloric acid (curve 1), in water (curves 2, 3) and in N/100 sodium carbonate (curves 2, 3)

Fig. 5. Plot of percentage transmission against λ for mixed dye system: methyl violet (80 mg/l.) in water and disulphine blue VN 150 (80 mg/l.) in N/180 hydrochloric acid. Curve 1 refers to methyl violet/disulphine blue = 1/50 v/v. Curve 2 refers to methyl violet/disulphine blue = 1/5 v/v

region can be altered by changing the pH of the solution filters is evident from the curves in Fig. 4. The same effect can also be obtained in a mixed dye system by suitably adjusting the composition of the mixture. The curves obtained with a methyl violet/disulphine blue mixture have been found to bear a close resemblance to those of disulphine blue alone at different pH values (Figs. 4 and 5).

These solution filters have been compared with the Hilger and Watts 'Spekker' coloured glass filters. The latter suffer from the limitation that their percentage transmission value is very low (about 14–29 per cent), although the width of the transmission zone is about 60–70 mμ.

The dye solutions have been exposed to direct sunlight and also a 500-W tungsten filament lamp at a constant voltage of 230 V for about 24 h and have been found to be photo-stable.

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Ionizing Radiation and Lightning Hazards

MR. P. J. GILLESPIE has recently questioned the claim that a small radioactive source attached to a lightning conductor can provide protection over a wide radius as a result of ionization of the surrounding air¹. He points out that if this claim is justified, then users of large sources of ionizing radiations in hospitals and industry may be at considerable hazard from lightning.

A little further simple arithmetic illustrates well the improbability, to say the least, that a small radioactive source could be effective as a lightning conductor. According to Gillespie, a commercially available type has a source of 706 μc. radium 226 and is claimed to give protection over a radius of 100 m. At this distance the gamma-ray dose-rate is 6×10^{-5} mr./h or 1.6×10^{-11} r./sec. The average background of ionizing radiation (cosmic rays, Earth gamma-rays, etc.) in Britain gives a dose-rate of 100 mr./year or 3×10^{-9} r./sec. In terms of ion density, the natural background gives about 6 ion pairs/cm²/sec, whereas at 100 m from the radioactive lightning conductor there is an additional 0.03 ion pairs/cm²/sec. It is difficult to believe that this increase of 0.5 per cent in the ion density can significantly affect the path of a lightning stroke. Furthermore, the background ionization, the mean value of which is given above, varies considerably over the country, probably by a factor of at least two. For example, the granite city of Aberdeen and parts of Cornwall have backgrounds appreciably higher than most other places. Local variations in natural ionization must be considerably larger still. As Gillespie points out, a 3,000-c. cobalt-60 source can produce a dose-rate of 6×10^{-5} mr./h at 60 miles; alternatively, it can double the average background ionization at 3–5 miles. No evidence seems to have been produced that natural or man-made variations in the atmospheric ion density have any effect on the frequency or course of lightning strokes. The *reductio ad absurdum* of the claim that a small radioactive source can significantly increase the efficacy of a lightning conductor is almost complete.

One further important point should be mentioned. Gillespie's letter states that legislation governing the use of the radioactive lightning protection device has been passed under the Radioactive Substances Act, 1960. This surely must be a misunderstanding. To the best of my knowledge, the Radioactive Substances Act, 1960, is concerned entirely with registration, rules, facilities, etc., for the disposal of radioactive wastes and has no clause which could authorize the use of any particular radioactive device.

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