Using this method, we have located the following electronic transitions :

Benzene	37,850 and 47,100 cm.$^{-1}$
Naphthalene	32,150, 34,700 and 45,200 cm.$^{-1}$
Anthracene	26,650 and 39,700 cm.$^{-1}$

All the determinations were made in ethanolic solutions, and the frequencies given refer to this solution. They may, however, easily be corrected to the vapour state.

If several electronic transitions—as often may be the case—lie close together, the temperature effect will be of a more complicated nature. The results of measurements on *cyclo*-octatetraene[1] and diphenyl may be explained in this way. We are continuing the investigation of this and similar problems of importance for a further development of the general method.

A full account of the work described above will appear shortly elsewhere[2].

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[1] *Acta Chem. Scand.*, **3**, 778 (1949).
[2] *Kgl. danske Vidsk. Selsk., mat. fys. Medd.* (in course of publication).

Dielectric Deterioration due to Internal Discharges

THE effect of discharges in voids enclosed in polythene (Fig. 1*a*), and in voids enclosed between polythene and metal electrodes (Fig. 1*b*), has been investigated using voltages up to twice the discharge-inception voltage at a frequency of 150 kc./s.

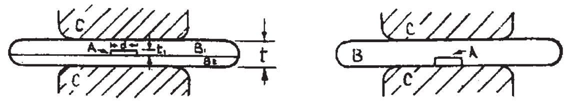

Fig. 1. Sections of circular polythene disks. (*a*) Air-filled cavity (*A*) enclosed between polythene disks (B_1 ; B_2). (*b*) Air-filled cavity (*A*) between polythene (*B*) and metal electrode (*C*). $t \simeq 0{\cdot}1$ cm. ; $t_1 \simeq 0{\cdot}01$ cm. ; $0{\cdot}05 < d > 0{\cdot}3$ cm.

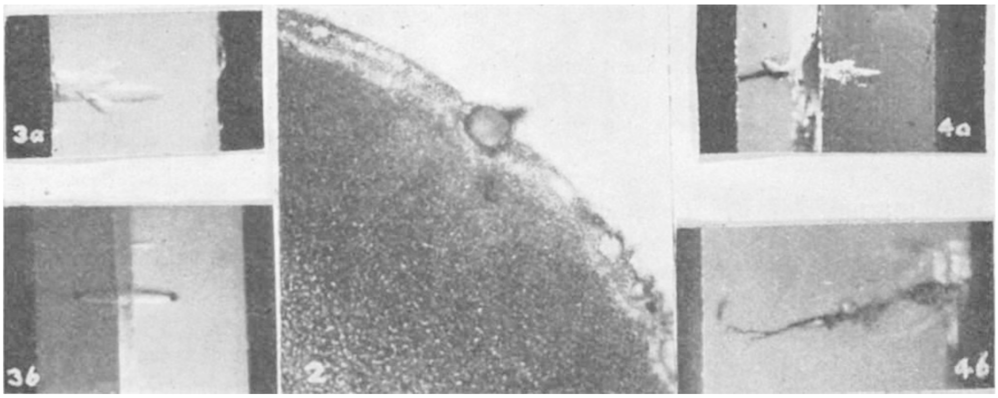

Fig. 2. Section of polythene disk B_2 (Fig. 1*a*), showing general surface erosion and deeper pits near the periphery of the void after 12 hr. at 11 kV.pk. (2 × discharge inception voltage). × 50

Fig. 3*a*, Section across the largest pit shown in Fig. 2. × 44. Fig. 3*b*. Section across polythene disks (Fig. 1*a*) showing short uncarbonized pits, and carbon at end of longest pits. × 21

Fig. 4*a*. Section across polythene disks (Fig. 1*a*) showing partial breakdown after 8 hr. at 9·7 kV. (2 × discharge inception voltage). × 28

Fig. 4*b*. Section across polythene disk (Fig. 1*b*) showing carbonized channel after 5 hr. at 9·5 kV.pk. (2 × discharge inception voltage). The void was adjacent to a brass electrode. × 45

Initially, discharges cause fairly uniform erosion on the polythene surface, and a transparent resin which fluoresces in ultra-violet light is formed. About 10^{-15} cm.^{3} of polythene is eroded by each discharge of 10×10^{-12} coulombs. This erosion, believed to be a result of thermal degradation, continues for many hours at the discharge-inception voltage ; but at higher voltages the discharge concentrates, after a few hours, near the periphery of the void, forming several deeper pits (Fig. 2). The energy liberated by each discharge in a pit increases with the length of pit, so that erosion progresses with increasing rapidity, and an uncarbonized partial breakdown channel is developed (Fig. 3*a*).

Resin formed in the pits is carbonized when the discharge in the lengthening pits attains a sufficient energy (Fig. 3*b*). When the void is adjacent to a metal electrode, this occurs in shorter pits than when the void is enclosed in polythene.

The mechanism of deterioration is believed to change when the pits attain a critical length ; sharply defined narrow carbonized channels are formed and, in general, rapid breakdown occurs (Fig. 4*b*).

It can be shown by calculation that over a length of some 10^{-4} cm. at the end of the pit, the electric stress may be concentrated to a value approaching the intrinsic electric strength of polythene. It is believed that destruction of the dielectric over this distance is followed by reconcentration of the stress, so that progressive breakdown occurs.

Short-wave radiation generated by the discharge may accelerate the initial deterioration of the polythene and also reduce the ultimate breakdown field-strength.

Tests with polytetrafluorethylene and acrylic resin show that these materials are less resistant to discharges than polythene under equivalent conditions.

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