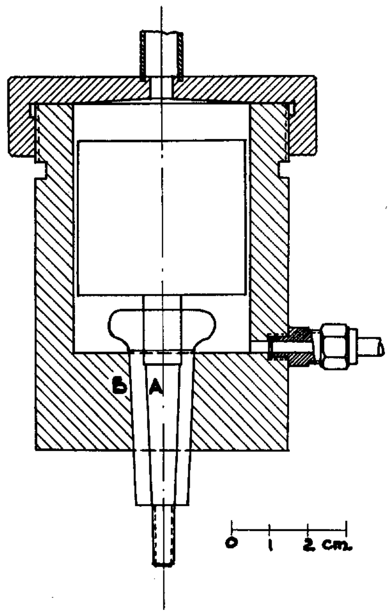

FIG. 1. Cross section of a capacitor for dielectric saturation measurements in liquids.

the dielectric constant $\Delta\epsilon$ as a function of the applied electric field, the well-aligned inner electrode is, for various reasons, very desirable. First, the gap used between the electrodes is very narrow (1 mm or less) in order to obtain large enough electric fields without employing very high voltages. Consequently, small deviations of the alignment produce considerable errors in field determination. Second, the capacitance increase due to misalignment produces a direct error in the $\Delta\epsilon$ measurement since $\Delta\epsilon=\Delta C/C_0$, where ΔC is the difference between the capacitance of the cell under voltage and without voltage, in both cases with liquid. This capacitance change is usually measured by the compensation method, using a high precision variable capacitor. C_0 is the capacitance of this part of the empty cell, where during the measurement there is a large enough electric field to produce dielectric saturation. In our case the electric field outside the gap is considerably weaker than within the gap, therefore, assuming a perfect alignment, we have $C_0=(2\pi l\epsilon_0)[\ln(r_{ex}/r_{in})]^{-1}$, without having to consider the total capacitance of the cell.

The accuracy of results depends on many other factors related with the $\Delta\epsilon$ measuring method and the accuracy is relatively very little affected by the capacitor. The error in determining the gap width, for calculating the electric field applied, can be kept below 1% due to the simplicity of the cell construction. Moreover, C_0 can be known quite precisely. The error introduced by changes of the capacitance of the cell, due to eventual deformation of the electrodes in a strong electric field, can be disregarded because of the rigid construction and good alignment. This is demonstrated by measuring $\Delta\epsilon$ of a nonpolar liquid in which case no change of capacitance is detectable. Since the smallest measurable capacitance change is $\Delta C=5\times10^{-4}$ pF, it can be seen that it is unnecessary to make corrections for electrode deformation.

The described capacitor can also be used in the resistivity measurement of dielectric liquids. Its internal resistance is of the order of $10^{12}\ \Omega$, although this value depends on the degree of cleanliness and dryness achieved with the glass joint. Considering that the form factor of the cell $\rho/R=500$ (ρ—resistivity of the liquid; R—measured resistance), it becomes obvious that it is quite possible to measure the resistivity in liquids without the need for correction in the results. The ratio ρ/R can be increased to 1000 by doubling the length of the cell.

For the measurement of the dielectric constant this cell has no advantages over those commercially available. The capacitance between A–B is relatively large and, referring to Fig. 1, it is approximately equal to $\frac{1}{4}$ the capacitance of the empty cell.

The author has used this type of cell only in the measurements of dielectric saturation in liquids and for this purpose it has rendered excellent service.

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Electroluminescent Panels as Bright Area Light Sources

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(Received 4 March 1965)

IN recording data on film it is often necessary to use lights as reference marks. Very often the lights must be flashed to give a reasonable exposure in a short time. Electroluminescent panels have been found to be ideal for these fiducial marks. For automatic scanning of spark chamber film, it was necessary to produce fiducial marks that were 12.7 mm squares uniformly illuminated over the entire area. With the high speed camera used for this experiment, the maximum exposure time available was about 4 msec. Under normal operating conditions for the electroluminescent panels, not enough light is produced in this period of time to produce a dark exposure on Tri-X film using an $f/11$ aperture. To obtain a dark enough exposure, the panels were driven at 4 000 cps with 600 V peak to peak. This was accomplished by gating the output of an audio oscillator for 4 msec. This signal in turn was fed to an audio amplifier whose output was stepped up to 600 V by an audio transformer. The Sylvania series PPF plastic panelescent lamps require approximately 3.1 W of power per square cm of lamp under these operating conditions.

* Work performed under the auspices of the U. S. Atomic Energy Commission.