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Note

A Modified Cell for Measurements of Dielectric Constant

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Several different cells for measurements of dielectric constant are described in the literature. In particular a glass cell with mirror walls, suitable only for some particular solvents, has been described fully¹.

In this note a cell will be described which is suitable for measurements of the dielectric constant of all solvents. The cell consists of permanent metal walls, it is easily filled and emptied, and may be used in conjunction with a thermostat.

The cell consists of two coaxial tubes (A and B), as shown in Figure 1. The space between the tubes (C) constitutes the effective volume of the cell, which is filled with the liquid to be investigated. The spacing between the inside surfaces of the two coaxial metal tubes is 2.5 mm. The cell is filled through the duct D which has a ground joint (E). The duct F is used to empty the cell. Mechanical strength and safety of manipulation with the taps and with the coaxial cable is achieved by fusing a glass rod, which has the shape of the letter T, on the vertical part on which comes a metal supporter which at the same time fixes both the cell and the coaxial cable.

To obtain the mirror walls the cell is filled to a certain height with a chemical solution². A thin silver layer is then applied to the wall by galvanic plating until a sufficiently thick silver layer is obtained. A battery of 2 V is used as source of the electric current, and the current intensity was controlled so as to be between 2 and 25 mA for a tube. At the beginning of galvanic plating a weak current is used, and only later, when the silver layer has become somewhat stronger, the current may be increased. Thus a peeling off of the silver layer from the glass is prevented. The time necessary for obtaining a sufficiently thick layer is 48 hours. It is desirable to interrupt the current several times, and allow the obtained mirror layer to dry completely. Contacts with the mirror layers are achieved by a coaxial cable, the inner wire of which is welded to the silver layer on the inside tube, while the cable shield is welded to the silver layer on the outside tube. In this way the inside silver layer is fully shielded electrically. Since the welded ends of the cable are very short, all outside variable capacitive influences are virtually eliminated, and stability of the work with the cell is achieved. After welding the coaxial cable to the mirror surfaces the completed cell is protected by a coating of plastic resin.

The cell volume is 6 ml., and its effective capacity for our cell is 9.4 pF for the interval $\epsilon = 2-3$.

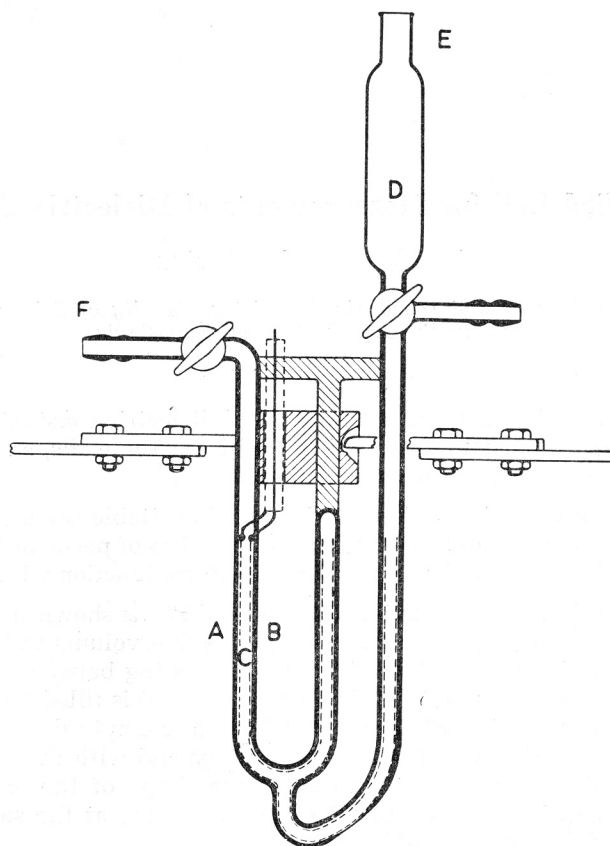


Fig. 1. Cell for measurements of dielectric constant. A. and B. coaxial tubes, C. the space between the tubes, D. and F. ducts, E. ground joint.

REFERENCES

1. L. A. Sayce and H. V. A. Briscoe, *J. Chem. Soc.* **127** (1925) 315.
2. LeFevre, *Dipole Moments — Their Measurement, and Application in Chemistry*, Methuen & Co., London, 3rd edition, 1953, p. 52.

IZVOD

Modificirana ćelija za mjerenje dielektrične konstante

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Opisana je ćelija prikladna za mjerenje dielektričnih konstanti. Ćelija se sastoji od metalnih obloga dviju koaksijalnih cijevi. Posrebravanje ćelije izvršeno je kemijskim i galvanskim putem. Kontakti sa koaksijalnim kabelom postignuti su lemljenjem. Volumen ćelije iznosi 6 ml a efektivni kapacitet je 9,4 pF za područje $\epsilon = 2-3$.

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