

**On the Electrical Conductivity of Some Dielectrics.** H. H. POOLE. (*Phil. Mag.*, Oct., 1921.)—By means of a transformer and two thermionic rectifying valves the opposite, parallel surfaces of the dielectric were brought to a difference of potential. The current that then passed through the insulator was measured by the deflection of a galvanometer. From the potential difference per unit of thickness and the current the conductivity of the specimen was calculated. In the experiments the difference of potential was progressively raised until the dielectric was punctured. In the case of mica this took place when the potential gradient was about 2.9 megavolts per centimeter. For glass the corresponding number is .6; for paraffin wax, .25; for shellac, from .04 to .25; and for celluloid, .16.

When a conductor of electricity, such as copper, is investigated by the method sketched above it is found that the current flowing through it varies directly as the applied difference of potential. This relation is what is expressed in Ohm's Law. In other words, the conductivity of copper is independent of the current flowing through it and of the difference of potential applied, so long as all other physical properties undergo no change. With dielectrics quite a different relation holds, as Mr. Poole brought out in papers published several years ago. He finds that the higher the applied potential difference the greater is the conductivity. The relation is expressed by the formula  $\log K = A + BX$ , where  $K$  is the conductivity,  $X$  the potential gradient, and  $A$  and  $B$  are constants. Upon plotting  $X$  as abscissa and  $\log K$  as ordinate, it is seen that for mica and glass at least the curves are nearly straight lines, though in the case of mica in the higher ranges of potential a curvature shows itself. Mica, when tested at different temperatures, presents curves which are parallel to one another, while for glass the slope of the curves changes in a systematic way with temperature. The influence of temperature on the resistivity of mica is enormous. For a certain specimen the resistivity for low potential gradients is 312 times as great at 13° C. as at 128°. Furthermore one specimen of mica shows a resistivity about 100 times that of another specimen, even when conditions are almost alike.

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