than ionic migration. It is therefore not surprising that there is no simple relation between conductivity and viscosity of molten salts. For example, the temperature coefficients of the two properties are not equal.

With the alkali chlorides there is a distinct increase of the activation energy (C) from lithium to cæsium, together with a decrease of the ratio of anion to cation radius (r_A/r_C). The small values for lithium chloride and sodium iodide are probably due to comparatively small energy barriers in systems in which r_A/r_C is great ; in the case of lithium chloride, the small cations must have considerable freedom of movement between the large anions in contact.

The C-values of the alkaline earth chlorides are greater than those of the alkali chlorides because of the stronger electric field in an assembly containing bivalent ions, and also because these molten electrolytes—by analogy with the solids[5]—may be expected to be anion conductors.

<div align="right">
E. HEYMANN.
H. BLOOM.
</div>

Chemistry Department,
University of Melbourne,
Melbourne.
April 12.

[1] Ward, A. G., Trans. Farad. Soc., 33, 88 (1937).
[2] Most values taken from Barrer, R. M., Trans. Farad. Soc., 39, 48 (1943) ; others calculated from data by Karpachev, S., and Stromberg, A., J. Phys. Chem. (U.S.S.R.), 11, 852 (1938).
[3] Calculated from conductivity data by Biltz, W., and Klemm, W., Z. anorg. Chem., 152, 267 (1926).
[4] Frenkel, J., Acta Physicochimica U.R.S.S., 6, 341 (1927).
[5] Cf. Mott, N. F., and Gurney, R. W., "Electronic Processes in Ionic Crystals" (Oxford, 1940).

Dielectric Constants of Some Titanates

THE oxides and carbonates of beryllium, magnesium, cerium, zinc, strontium, cadmium and barium were heated with titanium oxide to a temperature of about 1,500° C. The dielectric constants of the titanates thus obtained were, for beryllium titanate 70, for magnesium 17, for calcium 115, for zinc 30, for strontium 155, for cadmium 62, exceeding 1,000 for barium. The measurements were carried out at room temperature at a frequency of 1 M Hz.

The titanates may be divided into two groups according to their place in the periodic system and the values of their dielectric constants. The titanates of beryllium, calcium, strontium and barium belong to the first group, and those of magnesium, zinc and cadmium to the second one. Such a division in general coincides with the division of the titanates according to the type of their crystal lattice. The crystal lattices of the titanates of calcium, strontium and barium are of the perovskite type, whereas those of magnesium and cadmium are of the ilmenite type. The atomic or ionic polarizability depends upon the structure of the crystal, and for this reason the magnitude of the dielectric constant depends upon the type of the lattice.

The dielectric constants of the perovskites investigated were found to grow with the increase of the size of the alkaline-earth ion. The electron polarizability of the ion increases with the radius. A more important factor, however, is that with the increase of the radius of the alkaline-earth ion located in the centre of the elementary cell, the distance between the titanium and oxygen ions increases as well.

Barium titanate having a very large dielectric constant, the distance between the titanium and
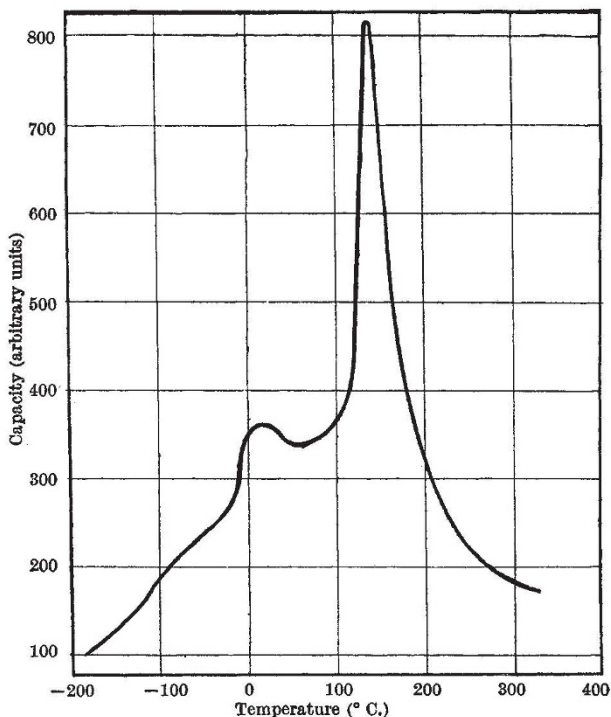
the oxygen ions exceeds the sum of their radii. Such a 'loose' structure of the crystal lattice leads to considerable atomic polarizability.

The dielectric constant of barium titanate varies considerably with the temperature. The variation of the capacity of a barium titanate condenser with the temperature is shown in the accompanying graph.

The present investigation was carried out with J. M. Golgman. A more detailed article will be published in the C.R. Acad. Sci. URSS.

<div align="right">B. WUL.</div>

Lebedev Physical Institute,
Academy of Sciences of the U.S.S.R.,
Moscow.   June 18.

A Photographic Method of Deriving Isoclinics in Photo-elastic Methods

IT is well known that the chief cause of inaccuracy in the photo-elastic method of stress analysis lies in deriving the isoclinics. We have used a photographic method which has greatly improved the accuracy with which the isoclinics can be drawn. It consists of varying the load on the model so as to blur out the isochromatic pattern (mercury green), leaving the isoclinics superimposed on a uniform grey background. The intensity of the light source is so adjusted as to enable a 30-sec. exposure of the photographic plate to be given, and the load is varied between a quarter and three-quarters of the full load used to take the isochromatic pattern. The reduction to three-quarters of full load is advisable to prevent fatigue failure. The model is carried through three complete cycles during the exposure.

<div align="right">B. DUNN.</div>

Dominion Physical Laboratory,
Department of Scientific and Industrial
Research,
New Zealand.   April 30.