operation of the air type of instrument. Also there is freedom from interference by dust and humidity.

Similar advantages to those claimed above for the attracted-disk electrometer are obtained in direct-reading electrostatic voltmeters when these are enclosed in vacuum. Several of these instruments are being developed, for various voltage ranges, extending from several kilovolts to hundreds of kilovolts. One such instrument has already given satisfactory operation in the measurement of voltages between 50 and 100 kilovolts. Although continuous evacuation is used in the present designs, it is intended later to seal the mechanism in a glass-metal envelope.

Further information concerning these developments will be published in due course.

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¹ Brookes, H. B., Defandorf, F. M., and Silsbee, F. B., *J. Research, Nat. Bur. Stand.*, **20**, 253 (1938).

² Palm, A., *Z. tech. Phys.*, **14**, 390 (1933).

Anodic Deposit of Protactinium

PREVIOUSLY described experiments¹ have shown that under certain conditions of electrolysis of sulphuric or hydrofluoric solutions of protactinium, this element can be deposited on the cathode, at least in extremely thin layers. I have now observed, in sulphuric solutions, an anodic deposit on a lead oxide (PbO₂) support. Normal solutions of sulphuric acid containing about 10⁻⁵ gm. of protactinium in presence of 1 or 2 mgm. of zirconium sulphate were used. With a cathode of platinum, an anode of platinum covered with lead oxide (PbO₂) and a current of 5–20 mA./cm.², the yield is 30–60 per cent after two or three hours, with moderate stirring. Under these conditions the deposit on the cathode is insignificant. An anodic deposit can also be observed on gold anodes, but these electrodes are severely attacked. I have never observed an anodic deposit on pure platinum electrodes. The yield is reduced if sulphuric acid is replaced by nitric acid.

The influence of the nature of the anode is not due to a difference in oxygen overvoltage. Measurements of the potential of the three types of electrodes against a calomel electrode were carried out and have shown, for a given current density, no significant difference; if anything, electrodes covered with lead oxide show a smaller positive potential than the platinum and gold ones. It is known, however, that PbO₂ anodes favour electrolytical oxidations; for example, the formation of chromic and periodic acid.

As to the nature of the deposit, it is still uncertain. Usually, metallic peroxides formed at the anode correspond to a state of valency of the metal superior to the normal. The valency of protactinium in sulphuric solutions being already 5, what can be the valency of the anodic peroxide?

The investigation is being continued in order to

clear up this question, as well as the mechanism of the deposition.

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¹ Emmanuel, H., and Haïssinsky, M., *C. R. Acad. Sci.*, **206**, 1102 (1938); Bouissière, M., *J. Phys.*, **2**, 72 (1941).

X-Ray Study of the Solution of Alkali Halides in Borax and B₂O₃ Glass Systems

A NUMBER of salts including alkali halides dissolve readily in glass. It has been suggested by S. K. Majumdar and R. M. Palit¹ that an X-ray investigation of the nature of these salts in the dissolved state inside the glass medium would be interesting. Such a study is naturally expected to give information regarding whether these salts form ionic, molecular or colloidal solutions, combine chemically with the glass medium, or induce any crystallinity in the glass itself. An investigation in these directions is being carried out in this laboratory.

Powder photographs of various alkali halides dissolved in glassy B₂O₃ and borax were taken at different concentrations and compared with powder photographs of the crystals of these substances. In the case of sodium chloride dissolved in borax, all the lines of sodium chloride and some lines which belonged neither to it nor to any of the known crystalline sodium borates appeared, as shown in the accompanying reproduction. The positions and relative intensities of the sodium chloride lines were identical with those of the pure salt. The sharpness of these lines indicates that *crystallites* of sodium chloride enter into glass. The average size of the particles in these colloidal solutions is under investigation. The only effect of using different concentrations of sodium chloride in borax was that the intensities of the sodium chloride lines increase with concentration. In the case of sodium chloride dissolved in B₂O₃ glass, the results were similar except that the new unidentified lines appeared only in weak solutions. For potassium chloride dissolved in borax and B₂O₃, the results were again similar; while in the case of rubidium chloride only the lines of pure rubidium chloride were obtained.

Thus we find that the alkali halides form colloidal solution in glass; the particle sizes are sufficiently large as to give sharp reflexions. Determination of the average size of these crystallites by measuring the half-intensity widths of these lines is in progress. Attempts are also being made to trace the origin of the extra lines that have been observed in the cases of dissolved sodium chloride and potassium chloride.

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