chambers used, it appears that these departures from the exponential are chargeable to the nonhomogeneity of the neutron beam and the dependence of the absorption in the sample upon the velocity distribution of the neutrons, rather than to response of the detector.

Recent results[5] have shown that the velocity distribution of slow neutrons has a maximum closely coinciding with the maximum in a Maxwellian distribution. In view of the theoretical prediction that the absorption should vary inversely as the velocity, it is of interest to show the absorption curve that would result from a Maxwellian distribution in time, and an absorption proportional to $1/V$.

The departure of the $1/V$ curve from the exponential form is seen in Fig. 2 to be even less than that of the experimental one.

We are indebted to Mr. H. C. Torrey who supplied us with the values of the integral

$$f(q)=\int_0^\infty e^{-q/y-y^2}y^3dy$$

which he obtained in connection with another problem.

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G. B. Pegram

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October 19, 1935.

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The Electrical Conductance of Colloidal Solutions at High Frequencies

Measurements of the electrical conductance and dielectric constant of suspensions and colloidal solutions have brought to light a number of interesting phenomena, originating, as it appears, at the interphases of the solution. In a recent letter to this journal[1] we have described the marked increase in dielectric constant which takes place at low frequencies. This note is concerned with a rise in electric conductance which is observed at high frequencies. The measurements were made up to 16,000 kc per sec. by comparison with potassium chloride solutions. On the basis of the theory of Debye and Falkenhagen[2] the frequency dependence of conductance of the potassium chloride solutions is sufficiently small to be disregarded in the present measurements. Associated with the rise in conductance, a small decrease in the dielectric constant of the colloidal solutions is observed.

Typical measurements on suspensions are shown in Fig. 1(A). They include powdered glass and kaolin suspended in potassium chloride and mineral oil in sodium oleate. The concentration of the potassium chloride has been varied to give specific conductances from 10^{-3} to 10^{-5} mho-cm^{-1} with no apparent change in the conductance-frequency curves. The specific conductance of the mineral oil emulsion was 7×10^{-4} mho-cm^{-1}.

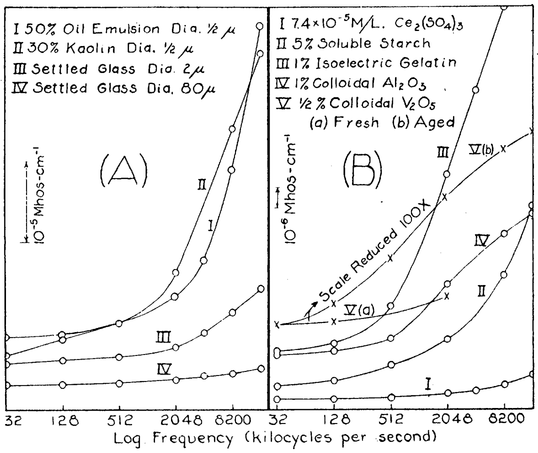

Fig. 1. Variation of conductance with log frequency.

In Fig. 1(B) are shown results obtained for a number of colloidal solutions, including aluminum oxide, vanadium pentoxide, starch and gelatin. The gelatin was measured at its isoelectric point. The aluminum oxide and vanadium pentoxide solutions were prepared by chemical precipitation, followed by washing and peptization with distilled water.[3] The vanadium pentoxide was measured immediately after being prepared and again three months later. With aging, there is a marked increase in the high frequency conductance. The low frequency conductance of this solution was 1.2×10^{-3} mho-cm^{-1}, while the low frequency conductance of the other colloidal solutions of Fig. 1(B) were around 5×10^{-5} mho-cm^{-1}.

This increase in conductance of suspensions and colloidal solutions is probably due, at least in part, to an effect of the same type as the Debye-Falkenhagen[2] effect in strong electrolytes,[4] i.e., it is produced because the static forces between the charges on the colloidal particles and those in the adjacent portion of the continuous phase produce, in an external field of low frequency, an interference with the displacement of the ions of the continuous phase. This interference becomes negligible at high frequencies.

For soils, various investigators[5] concerned with the problem of radio communication have found indications of an increased conductance at high frequencies. This increase probably is of the same type as that studied here.

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October 3, 1935.

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