NOTE ON ANOMALOUS DISPERSION AND ABSORPTION OF ELECTRIC WAVES.

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The writer has published several reports[1] in this journal on anomalous dispersion and absorption of electric waves for the wave-lengths between 50m. and 3m. In comparing his results with the dipole theory, the writer

(1) Mizushima, this Bulletin, **1** (1926), 47, 83, 115, 143 and 163.

referred to an older paper[1] of Debye in which only the plane motion of molecule is considered, and compared ϵ simply with n^2 (ϵ : dielectric constant; n : refractive index). It may not be out of place to notice that quite recently he supplemented his former results with the data which he obtained for a still shorter wave-length (60 cm.).[2] This time the writer used the following formula derived in a recent paper[3] of Debye :

$$\epsilon = \frac{\epsilon_0 + \left(\frac{\epsilon_0+2}{\epsilon_\infty+2}\right)^2 \left(\frac{4\pi\eta\alpha^3}{kT}\right)^2 \omega^2 \epsilon_\infty}{1+\left(\frac{\epsilon_0+2}{\epsilon_\infty+2}\right)^2 \left(\frac{4\pi\eta\alpha^3}{kT}\right)^2 \omega^2}$$

in which ϵ is the dielectric constant measured for the frequency $\frac{\omega}{2\pi}$, ϵ_0 the static dielectric constant, ϵ_∞ the optical dielectric constant, η the viscosity, α the molecular radius, k Boltzmann's constant, and T the absolute temperature. The results obtained for monovalent alcohols (CH_3OH, C_2H_5OH, C_3H_7OH, iC_4H_9OH, $iC_5H_{11}OH$) were in good agreement with the above formula; i.e. the molecular radii calculated from the experimental values of ϵ and η were found to have reasonable values. The results with glycerine, however, are not in accordance with the theory. The discrepancy would be accounted for, if glycerine be a colloidally dispersed system so that the effective viscosity acting against the rotation of molecule is quite different from the viscosity of the liquid in bulk.

In the recent book of Prof. Debye on "Polar Molecules," only my former papers are quoted. In this book, Prof. Debye not only recalculated the data just as I had done in my new paper, but also gave further valuable explanations of them.

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(1) Debye, *Verh. Deut. Phys. Gesel.*, **15** (1913), 777.

(2) Mizushima, *Scientific Papers of the Institute of Physical and Chemical Research, Tokyo*, **9** (1928), 209.

(3) Debye, "Handbuch der Radiologie," VI, (1925).