LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the eighteenth of the preceding month, for the second issue, the third of the month. Because of the late closing dates for the section no proof can be shown to authors. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

The Variation of the Diamagnetism of Water with Temperature

Honda and Shimizu[1] have recently derived an equation expressing the variation of the diamagnetic susceptibility of water as a function of its temperature. They cite in support of their conclusions, the experimental results of Mathur[2] and Cabrera and Fahlenbrach,[3] the general agreement between theoretical and experimental results being considered entirely satisfactory. However, in view of the estimated precision of measurement of magnetic susceptibilities, these experimental results and also the experimental results of other investigators do not show on the whole, a very satisfactory agreement.

While the values obtained by a considerable number of observers for the temperature coefficient of the susceptibility ratio χ/χ_{20} at room temperature is reasonably satisfactory, the investigations made on the variation of the susceptibility at higher temperatures show divergent results. Several observers have found the change in susceptibility to be a linear function of the temperature. The results of the investigations of Wills and Boeker,[4] however, seem to indicate an anomalous variation in the region from 35°–55°C, definite breaks occurring in the slope of the mass susceptibility—temperature curve.

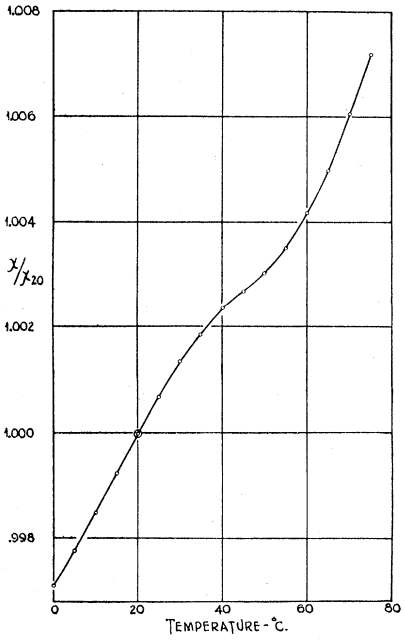

FIG. 1. Variation of susceptibility of water with temperature.

Using the manometric balance already described,[5] having greater sensitivity than that employed by Wills and Boeker,[4] the author, several years ago, made careful relative susceptibility measurements of water over the range of temperatures from 2°–74°C in order to investigate the reported anomalies. The results of these measurements are reproduced in Fig. 1, the indicated values of χ/χ_{20} being calculated from the values of κ/κ_{20}, the relative volume susceptibilities, obtained by interpolation with the aid of a large scale graph of the experimental results. These data are summarized in Table I.

TABLE I. *Variation of susceptibility of water with temperature.*

Temperature °C	χ/χ_{20}
0	0.9971
10	0.9985
20	1.0000
30	1.0014
40	1.0024
50	1.0030
60	1.0042
70	1.0061
75	1.0072

The results indicate a continuous, though irregular, increase of susceptibility with temperature, a marked change in slope occurring at 45°C. Over the range of temperature from 20°–60°C, the results are in very good agreement with the results of Wills and Boeker, as represented by the parabolic formula given by them. However, the general trend of the curve is such as to indicate divergent results for higher temperatures. Over the investigated temperature range, these results are in fair agreement with the results of Cabrera and Fahlenbrach[3] and Johner.[6] Here too, the general trend of the curve is such as to indicate divergent results for higher temperatures.

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[1] Honda and Shimizu, Tohoku U. Sci. Rpts. **25**, 939 (1937).
[2] Mathur, Ind. J. Phys. **6**, 207 (1931).
[3] Cabrera and Fahlenbrach, Zeits. f. Physik **82**, 759 (1933).
[4] Wills and Boeker, Phys. Rev. **46**, 907 (1934).
[5] Seely, Phys. Rev. **49**, 812 (1936).
[6] Johner, Helv. Phys. Acta **4**, 238 (1931).