of $-11.0\%$. In the course of the last experiment well crystallized barium chloride hydrated with $H^2H^2O$ was obtained with the view to examination for possible differences in crystal form as compared with the ordinary hydrate.

This decreased solubility of salts in $H^2H^2O$ as contrasted with ordinary water is probably a general effect governed by the fundamental differences between the two liquids. Further investigation should show other interesting differences between the two liquids as solvents.

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## SOME PROPERTIES OF HEAVY WATER

*Sir:*

We have measured a few characteristic properties of water containing various proportions of the heavy hydrogen isotope up to 92%, and have used these values for the purpose of extrapolation to 100%. The heavy water used in the experiments described in this communication was prepared by prolonged electrolysis of an alkaline solution with nickel electrodes. In estimating the proportion of $H^2$ from the density measurements, the value $d_{20}^4$ 1.1056 given by Lewis and Macdonald [THIS JOURNAL, **55**, 3057 (1933)] was used. All our experimental data are given so that even should the figure 1.1056 later prove to be wrong, our results will not be without value. The molar quantities are calculated assuming the molecular weight to be 20.032.

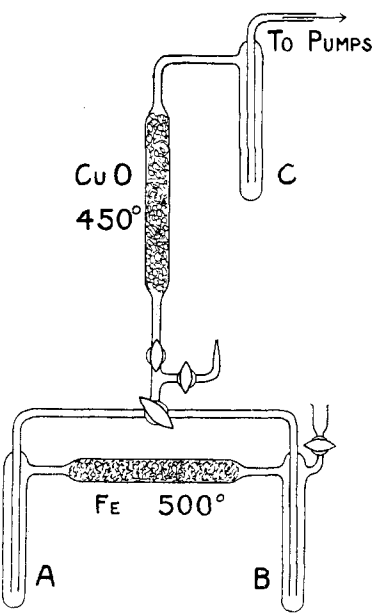


Fig. 1.—Apparatus for analysis of heavy water.

We have also attempted to determine the concentration of oxygen isotope $O^{18}$ by decomposing the heavy water and combining the hydrogen and oxygen with ordinary oxygen and hydrogen, respectively. This was done in the apparatus shown. The heavy water was passed back and forth over hot iron between the traps A and B, liquid air being used to collect the fractions. As the hydrogen was released it was passed over hot copper oxide and the resulting water was caught in trap C (Fraction X). Ordinary dry, oxygen-

TABULATED DATA ON HEAVY WATER

| | Ordinary water | 31% | 63.5% | 92% | 100% (calcd.) |
|---|---|---|---|---|---|
| Density $d_{20}^4$ | 0.9982 | 1.0314 | 1.0664 | 1.0970 | 1.1056 (Lewis) |
| Refractive index $n_{20}^D$ | 1.33293 | 1.33138 | 1.32992 | 1.32849 | 1.3281 |
| Refractive index $n_{20}^C$ | 1.33094 | 1.32959 | 1.32824 | 1.32683 | 1.3265 |
| Molar refr. (D line) | 3.711 | ..... | ..... | ..... | 3.677 |
| Viscosity $\eta_{20}$ (mp.) | 10.87 | 11.4 | 12.7 | 13.7 | 14.2 |
| Surface tension 20° (dynes/cm.) | 72.75 | 71.5 | 69.8 | 68.1 | 67.8 |
| Magnetic susceptibility $\chi \times 10^6$/g. | −0.72 | ..... | ..... | −0.65 | ..... |
| Molar susceptibility $\times 10^6$ | −13 | ..... | ..... | −13 | ..... |

free hydrogen was passed over the iron–iron oxide mixture and the water formed was frozen out in A (Fraction Y). Excess hydrogen was burned at the jet shown.

Fraction X was found to be identical in properties with the initial heavy water. Fraction Y could not be distinguished from ordinary water. There is, therefore, no appreciable concentration of $O^{18}$ in the electrolytic process.

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# NEW BOOKS

**Ternäre Systeme.** Elementare Einführung in die Theorie der Dreistofflegierungen. (**Ternary Systems.** An Elementary Introduction to the Theory of Three-Component Alloys.) By DR. G. MASING, Scientific Consultant, Siemens-Konzern, and Lecturer at the Technical High School of Berlin. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C 1, Germany, 1933. viii + 164 pp. 166 figs. 15 × 5 × 23.5 cm. Price, M. 8.30; cardboard cover, M. 9.60.

"The purpose of this work," writes the author, "is . . . to give the fundamentals of the science of ternary systems in complete representation," somewhat freely translated. This has been done to a fuller extent than in any other text, as far as the reviewer knows. Even the standard Roozeboom, in the latest section on three-component bodies, issued as long ago as 1913, omits discussion of the occurrence of solid solutions, which a practical metallurgist could hardly leave out of consideration. Masing's text is particularly complete with respect to the treatment of systems in which solid solution occurs, and is written with thoroughness and clarity. The first eight chapters contain discussion of a purely general nature, on isotherms, crystallization processes and representations of isoplethal sections ("zur Konzentrationsebene sehnrechte Schnitte"). This purely general treatment is intentional, and advantageous to the author's plan of making the treatment complete; an occasional reference to actual systems which show