Details of measurement and crystal structure data will be given in another publication.

DEPARTMENT OF CERAMICS
PENNSYLVANIA STATE COLLEGE
STATE COLLEGE, PA.
NELSON W. TAYLOR
SANDFORD S. COLE

RECEIVED JUNE 22, 1934

THE RELEASE OF SUPERCOOLING IN CRYOSCOPIC DETERMINATIONS

Sir:

The freezing point method of determining molecular weights is one of our most useful procedures and the freezing point lowering of solution is of great theoretical importance. The precise determination of a freezing point may be obtained by supercooling the liquid or solution under suitable conditions and releasing the supercooling to allow the system to come to equilibrium. The exact freezing point is determined in this way. The release of the supercooling without too great supercooling has always been a difficult matter but we have found that a little glass bead may be cooled on a cake of dry ice (solid carbon dioxide) and then introduced into the system and so releasing the slightest amount of supercooling.

Ordinary glass beads 3 mm. in diameter with 0.5 mm. bore may be wet with solvent or liquid and placed on the cake of dry ice for a few minutes and then with forceps may be transferred rapidly to the supercooled liquid. At ordinary laboratory temperatures the little core of ice will not melt in thirty seconds or more, so there is ample time. The suitably cooled bead, quite free of ice, will also release supercooling as it may be introduced into the system while at a very low temperature. If the bead is placed in the closed end of a thin-walled tube it may be cooled on dry ice and rapidly rolled into the supercooled system. We have readily released liquids or solutions supercooled only 0.04° and with experience a supercooling of as little as 0.01° is feasible. This should be of importance in determining the true freezing point of dilute solutions.

FRICK CHEMICAL LABORATORY
PRINCETON UNIVERSITY
PRINCETON, N. J.
DAVID E. KENYON
GEORGE A. HULETT

RECEIVED JUNE 23, 1934

THE SEPARATION OF THE OXYGEN ISOTOPES

Sir:

Although Washburn, Smith and Frandsen [*Bur. Standards J. Res.*, **11**, 453 (1933)] state that the electrolysis of sodium sulfate and sulfuric acid solutions produces oxygen with a greater proportion of O^{16} than is present in the water electrolyzed, Lewis and Macdonald [*J. Chem. Physics*, **1**, 341 (1933)] reported that no concentration of O^{18} was found when deuterium was concentrated by the electrolysis of sodium hydroxide solutions with nickel electrodes. Their method of analysis may not have been sensitive enough, however, to have detected small shifts in the isotopic composition of the water. We have electrolyzed 5% sodium hydroxide solutions with nickel electrodes and compared the density of water produced by burning this oxygen in purified tank hydrogen with that of water produced by burning air in the same hydrogen. The water from the electrolytic oxygen proved to be 7.7 p. p. m. lighter than Cambridge tap water and that from the air burned in the same hydrogen 1.1 p. p. m. heavier. Our results thus agree with those of Washburn, Smith and Frandsen in indicating a small but definite separation of the oxygen isotopes.

THE CHEMICAL LABORATORIES OF
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CAMBRIDGE, MASS.
CHARLES H. GREENE
ROGER J. VOSKUYL

RECEIVED JUNE 25, 1934

THE RELATIVE PROPORTIONS OF DEUTERIUM IN SOME NATURAL HYDROGEN COMPOUNDS

Sir:

The interesting observations of Lewis [THIS JOURNAL, **55**, 3503 (1933)] upon the antigerminative property of deuterium oxide led us to investigate the isotopic composition of the hydrogen utilized by plants in the synthesis of organic compounds with an expectation of finding a preference for protium in the biological synthesis. We find, however, in common with others who have reported upon parallel investigations [E. W. Washburn and E. R. Smith, *Science*, **79**, 188 (1934); M. Dole, THIS JOURNAL, **56**, 999 (1934)] since we began our work, that in some natural sources deuterium is more abundant than in ordinary water.

In our experiments "Mazola" corn oil was burned in dried air and the products of combustion passed over hot copper oxide before condensing the water. Natural gas from northern Pennsylvania was burned in air of such low humidity that any admixture of the water formed with ordinary water was negligible. After careful purification by standard methods, the samples of water were treated with a small amount of barium hydroxide and twice distilled in vacuum.

The final distillation in vacuum in which the water was evaporated without ebullition and passed through a meter of tubing to the measuring cell was found to effect considerable separation of the isotopic species present. The vacuum distillations were therefore carefully controlled and the densities measured were corrected to correspond to the rejection of equal light and heavy fractions. The corrections were all less than four parts in ten million. The vacuum distillation train was constructed with traps which could be closed by freezing plugs of ice in them so that the water which was measured came in contact with nothing but Pyrex glass. In the distillations at atmospheric pressure care was taken to reject small, nearly equal, light and heavy fractions.

Densities were measured by determining the pressure required for floating equilibrium of a thick-walled Pyrex float at 3.98°. The float was calibrated by means of a small glass rider. Pressure was applied through water-filled capillaries to avoid the solution of air in the sample being measured. In twelve experiments to determine the equilibrium pressure in a standard sample prepared from Cambridge tap water the average deviation from the mean was equivalent to an error of one part in ten million in the density. Our method resembles that used by Gilfillan in determining the isotopic composition of sea water [E. S. Gilfillan, THIS JOURNAL, **56**, 406 (1934)]. In essential agreement with his results we found surface sea water collected a mile off shore at Gloucester, Mass., to have a density greater than Cambridge tap water by 1.8 p. p. m.

The water from the corn oil proved to have a density greater than ordinary water by 4.9 ± 0.1 p. p. m. (two experiments) and that from natural gas, a density greater by 5.7 ± 0.3 p. p. m. (four experiments).

CHEMICAL LABORATORIES OF
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RECEIVED JUNE 25, 1934

NEW BOOKS

Annual Survey of American Chemistry. Vol. VIII, 1933. Edited by CLARENCE J. WEST, Director, Research Information Service, National Research Council. Published for National Research Council by The Chemical Catalog Company, Inc., 330 West 42d Street, New York, N. Y., 1934. 403 pp. 13.5 × 21.5 cm. Price, $4.50.

The method adopted in reviewing the recent literature is the same as that used in the last volumes of the Annual Survey. The authors are well known in their several fields and have described the new work as fully as is possible in the limited space available. The policy adopted last year of covering only a part of the published work makes it desirable to list the fields reported on in the present volume. They are as follows: Theories of Solutions, Kinetics of Homogeneous Gas Reactions, Subatomic Phenomena, Thermodynamics and Thermochemistry, Colloids, Contact Catalysis, Structure Determination by X-Ray and Electron Diffraction, Electrochemistry, Analytical Chemistry, Compressed Gases, Aliphatic Compounds, Carbocyclic Compounds, Heterocyclic Compounds, Pharmaceuticals, Biochemistry, Ferrous Metals in 1932 and 1933, Insecticides and Fungicides, Chemistry of the Silicates, Ceramics, Petroleum Chemistry and Technology, Cellulose and Paper, Leather, Paints, Rubber, Gaseous Fuels During 1932 and 1933. The book continues to be of great value to one who desires to obtain in a short time a general view of the advances made in Chemistry in America. It is also of value to the specialist as a source of references.

JAMES F. NORRIS

Manuel de Chimie Analytique Qualitative Minérale. (Manual of Inorganic Qualitative Analysis.) By P. WENGER, D.Sc., Professor of Analytical Chemistry, and G. GUTZEIT, Lecturer, University of Geneva. Librairie Georg et Cie., Genève, 5, Corraterie, Switzerland, 1933. 496 pp. 13 × 19.5 cm. Price, argent Suisse frs. 16.

This manual is similar in arrangement to most of the American texts but is much more extensive. The first part is devoted to a brief discussion of the fundamental principles of general chemistry. The second part gives the most important characteristic reactions, with the equations, of the common cations and anions, and also those for the rare metals. The third part of the book is devoted to the systematic analysis of materials, including the different types of preliminary tests. Tables, showing the procedure for the detection of the common cations and anions, are also included. The last part is devoted