TREHALOSE FROM YEAST

Sir:

The presence of trehalose in baker's yeast was discovered by Koch and Koch.[1] Myrbäck and Örtenblad[2] have published directions for the routine preparation of the sugar from this source, deproteinization of the yeast extract being accomplished with mercuric sulfate. They stated, as had earlier writers, that they could obtain no trehalose from brewer's yeast.[3]

We have modified their procedure by deproteinizing with zinc sulfate and barium hydroxide, and deionizing the resulting solution with ion-exchange resins. By this method we have obtained crystalline trehalose in yields up to 20 g. per kilogram of pressed baker's yeast containing about 70% moisture. When applied to waste brewer's yeast (both beer and ale yeasts) from several sources, this procedure has yielded up to 12 g. of trehalose per kilogram of yeast with similar water content. The yield varies with the history and particularly with the age of the yeast; it has been found, however, that the trehalose content of baker's (and presumably brewer's) yeast can be preserved for months even at room temperature by keeping the crumbled yeast under 95% ethanol. Details will be published later.

(1) E. M. Koch and F. C. Koch, *Science*, **61**, 570 (1925).

(2) K. Myrbäck and B. Örtenblad, *Biochem. Z.*, **288**, 329 (1936).

(3) See also M. Elander and K. Myrbäck, *Arch. Biochem.*, **21**, 249 (1949).

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NEW BOOKS

Scientific Foundations of Vacuum Technique. By SAUL DUSHMAN, Ph.D., Assistant Director, Research Laboratory, General Electric Company, Schenectady, N. Y. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. xi + 882 pp. 326 figs. 218 tables. 16 × 23.5 cm. Price, $15.00.

This book covers a great deal more than the shelf title "Vacuum Technique" would indicate since, as stated in the preface, "the writer has not dealt specially with experimental procedures for using vacuum technique" but "has attempted to present a survey of fundamental ideas in physics, chemistry, and (to a smaller extent) metallurgy, which will be found useful to both scientists and engineers in dealing with problems in the production and measurement of high vacua." In fact, chemists and metallurgists whose primary interest is not vacuum technique will find much of value in the second half of the book dealing with sorption, vapor pressures, dissociation of oxides, etc.

Following the pattern of his earlier work "Production and Measurement of High Vacuum" (published by the General Electric Review in 1922) Dr. Dushman begins with chapters on kinetic theory and flow of gases, then presents well illustrated chapters on mechanical pumps, ejectors, diffusion pumps, and vacuum gauges, while the remaining chapters (468 pages) deal with the sorption, gettering, and diffusion of gases, and a very thorough analysis of the published data on vapor pressures, rates of evaporation, dissociation pressures, free energy, and other thermodynamical properties of gases, metals and metallic oxides, hydrides, and nitrides. Over 1200 citations are made in the footnotes to literature references, and it is evident that the author has made a special effort to cover as much of the available literature as possible up to the summer of 1948 and to present the most reliable data in the form of graphs and tables.

As an example of interest to chemists and metallurgists of the comprehensive and critical method of the author we note from page 743 that Dushman spent much time compiling a table on the vapor pressure and rate of evaporation of the metallic elements by combining the best data from publications by Kelley (1935), by Ditchburn and Gilmour (1941) [*cf. Rev. Sci. Instruments*, 19, 921 (1948)], and a very complete Manhattan Project Report (1946) by Leo Brewer (and collaborators) on the "Thermodynamic and Physical Properties of the Elements." He comments on the agreement between data on the same element and presents a criticism, based on experiments in his own laboratory and a previous paper by Fischer, of data on aluminum and chromium by Baur and Bruner on which Dushman feels that Brewer has placed too much reliance.

The chapters on sorption are based on the books by Brunauer, McBain and Gregg, supplemented by the recent work of Armbruster and others reported in THIS JOURNAL. Dr. Dushman is particularly well qualified to review the literature on sorption, outgassing, chemical and electrical clean-up of gases, and thermionic emission since many of the important advances in these fields were made by Irving Langmuir and other G. E. scientists not to mention Dushman's own significant contributions.

The author has chosen an interesting style of writing which allows the original investigators "to speak for themselves" as much as possible. However, as might be expected in a work of such magnitude, whole articles must frequently be condensed into a few sentences or another author's summary must be relied on, and occasionally the summary does not reflect accurately the original content [*e. g.*, on page 270 Dushman states that a correction factor for deviations from Boyle's law *must* be applied to the readings of a McLeod gauge for "condensible" gases such as carbon dioxide, ammonia, and sulfur dioxide, whereas the article by Francis which he cites in support of this statement actually indicates that the correction for deviations from Boyle's law for these gases is negligible in most cases and that erratic results with these gases are rather due to adsorption on the walls]. Individual readers may also discover that certain important references have been omitted [*e. g.*, in the discussion of Langmuir's film theory of heat conduction no mention is made of the experiments by Brody and Korösy: *J. Applied Phys.*, 10, 584–596 (1939)].

To those of us engaged in research on high vacuum equipment and applications this book is a classic which will long remain our chief reference work. The book represents a lifetime of research and study by the outstanding authority on the basic physics of high vacuum, and with its publication Dr. Dushman has retired as assistant director of the General Electric Research Laboratories.

BENJAMIN B. DAYTON