NEW BOOKS

Modern Colloids. An Introduction to the Physical Chemistry of Large Molecules and Small Particles. By ROBERT B. DEAN, Ph.D., Assistant Professor of Chemistry, University of Oregon. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y., 1948. xi + 303 pp. 16 × 23.5 cm. Price, $3.75.

As stated in the Preface, this book is designed to serve as an introduction to the behavior of colloidal material. According to the author, colloid chemistry had fallen into bad repute, but much of the dead wood is being cleared away. The reviewer doubts that this book will assist in this process of rejuvenation.

The author's definition of colloids is not up to date and will give the reader an entirely wrong impression of what colloid chemistry stands for. The statement that nearly all of the properties of lyophobic colloids are due to the presence of impurities makes one wonder if the author realizes that this statement is not only incorrect but is a serious affront to the memory of men like Wo. Ostwald, H. Freundlich, and to all those who still are devoting their lives to the study of lyophobic colloids.

Ultramicroscopy by incident light and its applications in research pertaining to lyogels are not mentioned. A more adequate discussion of ultramicroscopes, their construction and application would be far more appropriate than the eulogy of the electron microscope, which also has its limitations, particularly in the study of lyophilic colloids. That solutions of proteins and other high polymers show no Faraday–Tyndall effect is contrary to fact. In the chapter on liquid surfaces, the drop weight, drop number and pendant drop methods are not mentioned. The statement that a thixotropic gel sets only when the particles associate is contrary to experimental evidence. Ebonite, or hard rubber, is not a thermosett, but a thermoplastic resin. The discussion of rubber latex is incomplete because it disregards the most basic colloidal phenomena. The structural diagram of montmorillonite (Fig. 11–7) does not explain cation exchange because it lacks the ion substitutions in the Gibbsite layer necessary for this phenomenon. The explanation as offered is not in line with known facts. When using illustrations copied from other publications, reference should be made to the one in which it originally appeared. The references to scientific and technical books and periodicals are incomplete.

Based on these statements, the reviewer's opinion may now be summarized:

The author deserves credit for his enthusiasm and for his desire to stimulate the interest of others in the multifarious colloidal phenomena in such diverse fields as chemistry, biology, medicine and agriculture. It would be risky, however, to depend upon this book for an introduction to the behavior of colloidal materials, because it disregards many basic phenomena characteristic of this state of matter or offers inadequate explanations; and its organization will confuse the reader more than it will enlighten him.

ERNST A. HAUSER

Autoxidation of Diethyl Ether and its Inhibition by Diphenylamine. A Chemical, Biological and Clinical Study of Some Practically Important Problems Concerning the Protection of Anesthetic Ether against Disintegration. By GUNNAR LINDGREN. P. A. Norstedt and Son, Stockholm, Sweden 1946. 190 pp.

The subtitle of this monograph is rather misleading. Ether does not *disintegrate* or lose its potency, like other delicate *materia medica*. However, as is well known, if ether stands for some time in bottles with access of air from frequent pourings, it forms through oxidation small amounts (seldom greater than 1%) of undesirable impurities, chiefly peroxides, acetaldehyde and acid. Of course, such treatment of ether intended for anesthesia is wisely interdicted by the pharmacopoeias of all nations. It is this familiar but complicated oxidation reaction and its prevention which forms the central theme of this investigation.

It also seems misleading to say (*vide* p. 10) apropos of the experiments of Mendenhall, Knoefel, *et al.* (*vide* p. 83) that "it therefore seems clear that *the existence of autoxidation products in anesthetic ether involves considerable practical inconvenience* . . . . . on account of autoxidated ether containing biologically extremely active substances, which may possibly disturb the course of the anesthesia and also involve an increased risk for the patient," because only through gross carelessness could ether containing 0.05% peroxide and 0.13% of aldehyde find its way into the operating room.

The standards of acceptability for the *freshly* prepared product are now so rigorous that no such amounts of auto-oxidation products could exist in it and one may say without fear of contradiction that anesthetic ether almost the world over is one of the purest substances used in medicine. Furthermore, anesthetic ether of the composition prescribed by the U. S. Pharmacopoeia in the manufacturer's original packages will keep its original purity for long periods of time—amply sufficient for all practical purposes.

The situation is somewhat different in Sweden, however, as the Swedish Pharmacopoeia prescribes for anesthetic purposes and designates as "Aether ad Narcosin" an ether free from alcohol and water (presumably treated with metallic sodium to remove the last traces of water) and put up in bottles of 100 grams capacity. Apparently one of the principal objects of this investigation was to ascertain whether any of the cheaper grades of Swedish ether could be substituted for this expensive product and still retain satisfactory keeping qualities. The author shows how this end may be accomplished by the addition of 0.02% of diphenylamine (one of the many substances known to inhibit the formation of peroxides in ether) to a grade of Swedish ether designated simply as "Aether Ph.S.," which is bottled in dark glass to exclude the actinic rays. The use of inhibitors, however, has not met with favor in America. Here the problem has been solved by the use of a pure ether of a slightly different composition[1] than that made in Sweden, and packaged in specially treated tin containers. The author states that in his stability tests this cheaper grade of Swedish ether, if no diphenylamine was added, acquired peroxides more rapidly than did the specially prepared "Aether ad Narcosin," but points out that one should not conclude that "Aether ad Narcosin" possesses more stability, since the bottles and light exposure were not identical in the two stability tests. It is to be regretted that this interesting grade, namely, "Aether ad Narcosin," was not included for direct comparison.

The author also tested the stability of ether in drums, and on page 48 we find the statement that ether in drums seems less stable than in bottles. The basis for this statement was the fact that the special grade, "Aether ad Narcosin," in bottles had kept almost perfectly for a year, whereas the grade known simply as "Aether Ph.S." in the manufacturer's drums had shown a marked decomposition. Since the grades of ether were entirely different, and the drums were galvanized (zinc being a very undesirable metal in contact with ether), the conclusion seems hardly rigorous; indeed, it is partially retracted on the next page.

(1) "Ether contains from 96 per cent. to 98 per cent. of $C_4H_{10}O$, the remainder consisting of alcohol and water" (U. S. P. XIII).

An excellent summary and criticism of the various methods for the determination of peroxide, acetaldehyde and acid is given in the section on chemistry. In passing we would like to remark that with a little experience an approximation of the amounts of peroxide and aldehyde, sufficient for evaluating the quality of anesthetic ether, can be made instantaneously by simple visible comparisons of the colors obtained with the well known sulfocyanate test for peroxides and Nessler's reagent for aldehyde as against sets of standards.

Under the heading, "Purification of Autoxidated Ether by Potassium Hydroxide," and also in other sections, Lindgren discusses the results obtained in his experiments and, taking cognizance of some similar results of Reimers, he concludes that "with the help of potassium hydroxide it is possible to obtain an ether almost free from peroxide, aldehyde and acid which is rather stable when kept in the dark." Twenty years ago this reviewer, E. Mallinckrodt, THIS JOURNAL, **49**, 2655 (1927), in studying the then widely used German Pharmacopoeia (Ph.G.VI) test for aldehyde, which is based upon this reaction, showed that with anhydrous ether to which as much as 0.1% pure acetaldehyde has been added, the formation of brown aldehyde resin on the surfaces of the lumps of potassium hydroxide does not occur unless a small amount of moisture is present in the outer layer of the lumps of solid caustic. Thus, the efficacy of Lindgren's purification procedure when applied to Swedish anesthetic ether which is anhydrous cannot be taken for granted unless the above precautions are taken into account. It should also be noted that he used only about one-third of the proportions of caustic to ether that the German Pharmacopoeia prescribes for the aldehyde test.

In Part II, under the heading, "Experiments on Animals," a considerable point is made of the fact published by Knoefel and Murrell in 1935, and confirmed and continued by Lindgren, that the time required to induce anesthesia in mice is longer if ether containing peroxides and acetaldehyde from long exposure to air and light is used, than if pure ether is administered under otherwise identical conditions. How important this observation of Lindgren and others may be one cannot say, unless one knows why this slowing is present. It would seem that in a work as extensive as this one, a direct attack upon this interesting problem would have been made other than by speculation. If, as seems probable, delay in induction is to be explained by the action of irritant substances reducing the respiratory minute volume, this might have been studied directly and in conjunction with the rate at which the anesthetic blood level of ether was achieved. Larger animals than mice would be required.

In this paper conclusions based upon deductions are sometimes resorted to, where direct examination would have been better and not difficult, as for example, in ascertaining whether an important accumulation of carbon dioxide in the bottles where mice were confined had occurred. It should also be pointed out that the untoward biological effects of ether containing peroxide and aldehyde, cited by the author, were obtained with specimens of ether containing much larger amounts than the various pharmacopoeias allow. It is thus hardly proper to refer to the ether used in Mendenhall and Connolly's investigation on the cilia of oysters, which contained 0.02% peroxides and 0.02% of aldehydes, as a "low percentage of autoxidation products"; this is at least ten and probably twenty times as much as the standard American anesthetic ether is allowed to contain.

In Part III under the heading, "Clinical Study," a tremendous amount of work has been done, but the study is too broad in that too many variables are considered for the number of cases studied. Moreover, important differences appear to have been overlooked and much unimportant data dilute the observations pertinent to the subject. Largely for these reasons, the clinical studies fail to carry conviction.

This study, as the author points out, was concerned wholly with Swedish absolute ether and so has no direct bearing on the anesthetic ether used in this country. Even with this restriction, however, little contribution has been made to an understanding of the auto-oxidation of ether in general.

Based upon its effect on mice, the author concludes that peroxidized ether treated with potassium hydroxide to remove peroxides and aldehyde contains an unknown biologically active principle not revealed by the usual chemical tests for the purity of ether. One must await with interest further evidence substantiating this possibility.

It is gratifying to have this study published in the English language and thus made accessible to a wide circle of readers. There are occasional lapses in clarity and in good usage, and often the results are presented in a curiously circuitous way, which a more careful editing could have eliminated, but the language is indeed commendable for authors whose native language is not English.

E. MALLINCKRODT

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March 10, 1948–April 10, 1948

A. E. BAILEY. "Cottonseed and Cottonseed Products. Their Chemistry and Chemical Technology." Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y., 1948. 936 pp. $17.50.

HARVEY DIEHL. "Electrochemical Analysis with Graded Cathode Potential Control." The G. Frederick Smith Chemical Co., 867 McKinley Ave., Columbus, Ohio. 56 pp. $1.00 (bound). Paper back copies available free of charge.

GORTON R. FONDA AND FREDERICK SEITZ. "Preparation and Characteristics of Solid Luminescent Materials." John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 1948. 459 pp. $5.00.

ROBERT S. HARRIS AND KENNETH V. THIMANN, Editors. "Vitamins and Hormones. Vol. V. Advances in Research and Applications." Academic Press, Inc., Publishers, 125 E. 23rd St., New York, N. Y., 1947. 478 pp. $7.50.

GREGORY PINCUS, Editor. "Recent Progress in Hormone Research. The Proceedings of the Laurentian Hormone Conference." Academic Press, Inc., Publishers, 125 E. 23rd St., New York, N. Y., 1948. 427 pp. $8.00.