

Book Reviews

Surface chemistry for industrial research. J. J. Bikerman. New York: Academic Press, 1948. Pp. ix + 464. (Illustrated.) \$8.00.

The writing of this book was an ambitious undertaking in which the author sought to show the applications of the fundamental theories pertaining to surfaces, to natural phenomena, and to industrial processes. The scope of the work is nearly as broad as that covered in Volumes I, III, IV, and VI of Alexander's *Colloid chemistry*.

The book is divided into 6 chapters. The chapter headings, number of pages, and number of references in the extensive bibliographies at the end of each chapter, are listed here in that order: "Liquid-Gas," 114, 297; "Liquid-Liquid," 39, 122; "Solid-Gas," 76, 193; "Solid-Liquid," 72, 187; "Solid-Liquid-Gas. Solid-Liquid-Liquid," 47, 134; and "Electric Surface Phenomena," 54, 111.

Fundamental theory for the liquid-gas and liquid-liquid interfaces and brief reviews of 12 or more methods of experimental study and measurement are given in 22 pages, most of which are at the beginning of Chapter I. Although the treatments are not as rigorous or as thorough as those given in such books as N. K. Adam's *Physics and chemistry of surfaces*, they will probably be satisfactory for the great majority of readers, and the many references make it easy for any reader to find more detailed and comprehensive treatments of any subject in which he may be particularly interested.

In pointing out the industrial applications, little or no space is used in explaining or describing the industrial procedures as such. The applications will therefore be best understood and appreciated by those who either are already familiar with the various steps in the procedures in which they are interested or who will make use of some other work to obtain the required details of procedure. This, of course, makes possible the covering of a wide range of subjects on relatively few pages, but it also means that a person interested in one particular industry will find relatively few pages concerned with his particular field. It does not follow, however, that the value which such a reader will receive is small because the number of pages is small. There is a decided advantage in having the application discussed clearly and briefly instead of being scattered through many pages of descriptive material.

One of the most valuable features of the book is the very extensive bibliography to which numerous references are made throughout the text. The treatment of the characteristics of solid surfaces, especially in regard to their smoothness and other factors which determine the contact angles which liquids make with the solids, is unusually thorough.

The work, in common with most works, has some faults. Most of these are the result of too great a condensation

of material in the development of equations and concepts. Early in the book (pp. 3-4), in presenting an aid for remembering the fundamental equation which relates the pressure inside of a bubble to the radius of the bubble, the author twice uses the statement, "The more crowded the radii the higher the pressure." To show this, he draws portions of two circles of slightly different diameters; one is concave downward and contains three radii 60° apart; the other is concave upward and contains four radii 60° apart. It would seem that he should explain that by "crowded" he means that the chord, or its subtended arc, formed by the radii intersecting the circle is less when the radii are shorter. However, there would be little need for this memory aid if a more complete explanation of why there is a pressure difference had been given.

In the index the subject "Gibbs Adsorption Theorem" is followed by references to pages 64 and 150. On each of these pages brief references are made to applications of the theorem. One of these pages contains a reference to paragraph 50 on pages 82-83, where a fairly complete discussion of the theorem is given. It is obviously an oversight that this longer treatment was not listed in the index.

Generally, however, the reviewer feels that the terseness, clarity of expression, and brief, pointed descriptions of applications of fundamental theory constitute the strongest and most characteristic features of the book. It is a valuable addition to our list of books dealing with colloid chemistry and deserves a place in every reference library concerned with that subject.

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Microwave mixers. Robert V. Pound (with a chapter by Eric Durand). (Ed. by C. G. and D. D. Montgomery.) (Massachusetts Institute of Technology Radiation Laboratory Series.) New York-London: McGraw-Hill, 1948. Pp. xii + 381. (Illustrated.) \$5.50.

This book presents the first collected data of a new art—that of the conversion frequency problem for microwave frequencies. This is a subject that was newborn out of the recent war. Whereas some of the previous volumes of this series tend to present the broad phases of microwave systems in semitechnical form, this volume treats a specialized portion of the microwave picture and subjects it to microscopic scrutiny. The purpose of such a thorough analysis is to yield data on microwave mixers sufficiently complete for design purposes.

The book is profusely illustrated with many perspective views and cross-sectional drawings of representative mixer assemblies. Dimensioning of the sectional drawings emphasizes very graphically the physical size and appearance of the "plumbing." The particular assem-