Book Reviews

Engineering Metallurgy. L. F. Mondolfo and Otto Zmeskal. McGraw-Hill, New York–London, 1955. ix + 397 pp. Illus. $7.50.

For some time there has been a need for a survey textbook in metallurgy for mechanical, chemical, and electrical engineers, because metallurgy has become such a dynamic field that the textbook writers have been unable to keep pace with the newest developments. Such a book is *Engineering Metallurgy,* which was written by two men who have had a great deal of personal experience with the subject matter while teaching at the Illinois Institute of Technology. The more recent developments have been worked in skillfully with the thoroughly understood fundamentals to produce a textbook that is a good guide for serious study as well as a survey of the science of metallurgy.

The presentation of the material is in logical sequence, beginning with a general discussion of the origin and extraction of metals from their ores that avoids getting lost in details about individual metals. The next three chapters take up the theory of alloys, giving special attention to phase diagrams in order to make easier a difficult subject for most beginning students. Both binary and ternary systems are discussed in detail. Two chapters cover some of the problems of melting and casting and are followed by two chapters on the principles of plastic deformation, work hardening, and recrystallization. A general discussion of phase transformations in the solid state and their effects on the properties of alloys is given, and four chapters are devoted to the more specialized topics of heat treatment, joining, powder metallurgy, and corrosion. The two final chapters briefly discuss commercial metals and alloys. Throughout the book emphasis is placed on principles rather than on descriptive details about specific metals.

There are obvious limitations on any book of this kind in that a choice must be made beween completeness and brevity. Although principles must often be stated without proof in a textbook such as this, these authors have given more than adequate references for further study where space prevented full explanation. In addition, a fine set of problems is given at the end of each chapter to challenge the student's ingenuity. This textbook should be helpful to anyone who wants a general knowledge of metallurgy and is certain to be widely used in engineering colleges everywhere.

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Basic Processes of Gaseous Electronics. Leonard B. Loeb. Univ. of California Press, Berkeley, 1955. xvii + 1012 pp. Illus. $13.50.

The stated purpose of this book is to present basic facts by which the properties of electric conductivity in gases can be understood. These properties include not only the conduction process and the breakdown process but also their relationship to all the environmental features that control these phenomena. The surface properties of the surroundings, including the electron emitters and collectors, are described and related to the conduction characteristics of the system. The flow of electrons through gases and, as the electron energy increases, the reactions and the results of this flow are described in considerable detail. The products of these reactions include excited and ionized atoms and molecules, which in turn react on other molecules or at surfaces to become neutralized and often generate additional electrons in the process.

This incomplete résumé is too brief to describe the range in subject matter dealt with in this book. It serves, however, to forewarn the reader that a comprehensive analysis of such a vast subject as gaseous electronics must of necessity cover so many intricate problems of physics that one person cannot expect to handle it adequately enough to meet present-day needs. L. B. Loeb did recognize this need for expert assistance in certain fields and obtained the very able cooperation of S. C. Brown of the Massachusetts Institute of Technology and G. H. Wannier, G. P. Molnar, and J. A. Hornbeck of the Bell Telephone Laboratories, who prepared limited sections of the book dealing with the subjects in which they are individually leading experts.

It was the intention of the author not only to present the basic facts but to do it in such a manner that the book could be used both as textbook material for instruction and as reference material for engineers and physicists. It was also assumed that such readers would not be well acquainted by advanced preparation with the necessary theoretical background required for a clear understanding of the complex phenomena involved. In my opinion that ambition to satisfy the needs of the readers is not realized.

A few specific points will serve to clarify the meaning of this criticism. Throughout the book there is considerable confusion of symbols, and at the same time there is no assembly of the definitions of symbols that will permit the reader to know with certainty the particular meaning intended on a particular page or in a particular equation in the text. For efficient use of a book as a reference it is necessary that the reader be able to obtain the correct definitions of symbols quickly. In general, the units used relate to the cgs system, and yet in some of the equations that involve such matters as work-function and the like there is such a mix-up of units that it would be extremely difficult for the uninitiated to use the equations for quantitative calculation. In addition to this confusion of units, there are an unusually large number of typographic and simple factual errors that have been overlooked because of inadequate editing as well as carelessness in proofreading.

Elementary results that come from classical kinetic theory are made unnecessarily mysterious by the relating of one average property of ideal gases to another average property, such as the average speed of the particles distributed in speed according to the Maxwell-Boltzmann distribution function. If the various averages had been related directly to the basic distribution function itself, the text would have been easier to understand and to teach. This fact may possibly explain why the treatment of probe theory is extremely weak. The discussion of space charge in its relation to probe theory and as it relates to the emission properties of heated cathodes is completely inadequate for the instruction of either the student or the engineer who wishes to apply the knowledge of these phenomena to problems of importance in gaseous electronics. The section on thermionic emission and field emission as it relates to the delivery of electrons into a gas discharge is poorly presented and therefore in many respects misleading.

The bibliography is extremely exten-