

formation concerning the corrosion behaviour of widely different materials has been carefully collected, taking into account the literature up to approximately 1985.

The first chapter, which discusses the corrosion properties in solutions of aliphatic aldehydes, contains a very well written introduction which describes the most important technical processes in which aliphatic aldehydes are used, and gives a summary of the most important corrosion problems. The different aldehydes are then described in detail, including a short summary of the corrosion problems that may arise for the given aldehyde in a given technical application. This descriptive part is more informative than the short summary table, which gives only general ratings for the different materials.

The same is true for the second chapter, which describes the corrosion behavior of materials in ammonia and ammonium hydroxide. Again, the introduction is well written, summarizing technical processes in which ammonia participates, and discussing major corrosion problems such as H-embrittlement in these solutions. The detailed description of the individual corrosion properties of the different materials is accurate and careful. In some cases, however, the electrochemical background of the corrosion process in electrolytes should have been presented more clearly, e.g. in the discussion of the activation of the corrosion process by  $O_2$  (p. 58), or in the description of the "chemical conversion process" of the corrosion induced by  $O_2$  (p. 55). Reference should have been made here to the electrochemical nature of the corrosion process, the  $O_2$ -reduction being the cathodic reaction.

Chapter 3 is devoted to corrosion in alkaline environments. In contrast to Chapters 1 and 2 the introduction is rather short, and presents only limited information on the technical processes in which NaOH is used, the practical corrosion problems, etc. The introduction provides some general information concerning pitting corrosion, pitting potentials and stress corrosion cracking. However, this information is rather limited, and should have been incorporated into a chapter devoted to basic corrosion mechanisms, which is missing from the Corrosion Handbook. The corrosion properties of the individual materials are discussed in great detail, with special emphasis on the corrosion of metals under conditions of stress corrosion cracking. After discussing the individual metallic, non-metallic inorganic, and organic materials, tables are presented which summarize the corrosion properties of these materials in different NaOH solutions at different temperatures, etc. These tables are quite informative to the reader. A point of criticism to the reviewer is the rather frequent statement of electrode potential without any reference system (Figs. 11, 20, 22, 23, ..., Table 11 ...). As an example, Fig. 19 shows the lifetime of an unalloyed steel in 33% NaOH as a function of the electrode potential. The result of this technically important figure is that stress corrosion cracking is observed only in a very limited potential range. However, the potential axis is given in "Volt" without any

reference, and consequently the figure could be quite misleading to inexperienced readers. The number of reference systems used in the Corrosion Handbook is quite large (Ag/AgCl, Cu/CuSO<sub>4</sub>, Hg/HgO, SME? page 112) and these should be summarized in the introduction.

The last chapter is concerned with the underground corrosion in soil. The introduction covers about 30 pages and describes the chemical composition of different soils, their corrosivity, corrosion due to microorganisms in soil, and the possibilities for protecting metallic materials in soil, e.g. by cathodic protection. In general, this part is well written and quite informative, but the electrochemical aspects of cathodic protection could have been presented in more detail, in a better arranged and more compressed form, without repeating the same facts—e.g. the correlation between organic coating and cathodic protection—in many places throughout the text. Some techniques which are used to measure the correct protection potential—e.g. switch-off potentials—are mentioned later in this chapter, and these too should have been incorporated into the introduction. The rest of the chapter is well written and, for example, clearly shows the importance of correctly chosen organic coatings for the corrosion protection of steel pipes which are polarized cathodically.

In summary, the second volume of the DECHEMA Corrosion Handbook is a highly valuable reference book for all engineers working in the area of corrosion, provided the user has a thorough knowledge of the basic physical concepts in corrosion science.

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**Semiconductor Electrodes.** Edited by *H. O. Finklea*. Elsevier, Amsterdam 1988. xxii, 520 pp., bound, Dfl. 340.00.—ISBN 0-444-42926-3

Continuing the series "Studies in Physical and Theoretical Chemistry" (Elsevier) a new edition entitled "Semiconductor Electrodes" is now available (Vol. 55). The ten chapters by different authors are devoted to particular semiconductor electrode materials. Following a concise and well written introduction by *H. Finklea*, Chapter 2 describes the photoelectrochemistry of the large band gap oxides TiO<sub>2</sub> and SrTiO<sub>3</sub>. A wealth of information on physical and photoelectrochemical properties is presented in this chapter. The inclusion of basic experimental aspects such as ohmic contacts, electrode preparation and sample mounting is definitely an advantage for the interested reader. Chapters 3 and 4 deal with other less intensively investigated semiconducting metal oxides (Fe<sub>2</sub>O<sub>3</sub>, SnO<sub>2</sub>, In<sub>2</sub>O<sub>3</sub> and WO<sub>3</sub>). Here, too, valuable information on electrode preparation and growth methods is given, in addition to the detailed analysis of the photoelectrochemical behavior.

In Chapter 5, Si and Ge are treated, including an important section on etching procedures which are of general relevance for those working with Si. *N. S. Lewis* and *A. B. Bocarsly* review the photoelectrode properties of these materials in aqueous and non-aqueous solutions, and include very specific topics such as derivatized surfaces (attaching mediators for improved redox activity). The following chapter on II-VI semiconductor electrodes reviews the fundamental photoelectrochemical observations on CdS, CdSe and CdTe. This chapter contains a section on thin film electrodes, including ceramic, vacuum deposited, electroplated, painted, sprayed and immersion-plated electrodes.

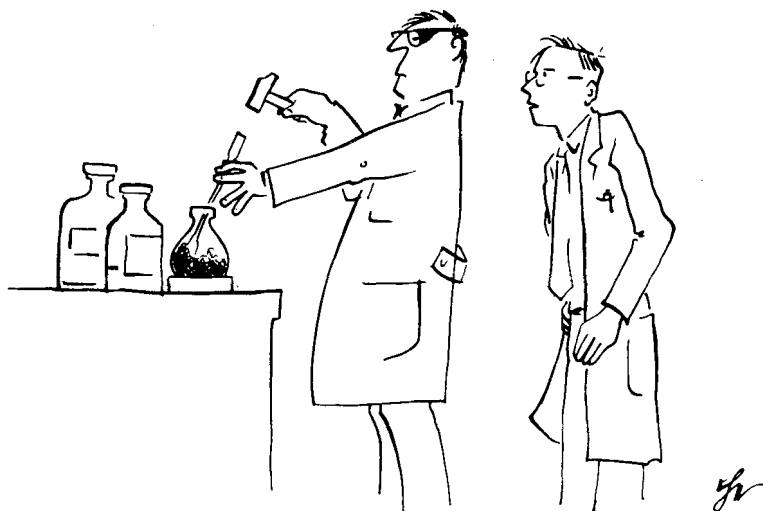
The next chapter treats GaP electrode behavior, and contains an interesting but somewhat speculative section on surface luminescence. Chapter 8 is a thorough and sound description of photoelectrochemical processes occurring on GaAs electrodes. Thermodynamic and kinetic aspects of electrode stability are dealt with, and expressions for the stabilization efficiency for three cases are given. Here *K. W. Frese, Jr.* also reviews CO<sub>2</sub> reduction at GaAs surfaces and includes data on light-to-electricity regenerative solar energy conversion. In Chapter 9 *L. F. Schneemeyer*, *A. Heller* and *B. Miller* review the many properties of InP electrodes. Eleven growth methods are briefly described including chemical vapor deposition, and liquid encapsulated Czochralski and molecular beam epitaxy. A short overview on solid state photovoltaic InP-based systems provides the background for the electrochemical sections that follow.

Photoanodes and -cathodes in aqueous and non-aqueous regenerative cells are thoroughly described, followed by a very intriguing section on hydrogen-evolving InP photocathodes covered by quasi-transparent metal catalysts. In addition, CO<sub>2</sub> and SO<sub>2</sub> reduction are treated. The chapter ends with a section on polycrystalline InP electrodes, including grain boundary passivation and hot carrier injection. The last chapter is devoted to the layered type transition metal dichalcogenides MoX<sub>2</sub> and WX<sub>2</sub>, X = S, Se. Here *B. Scrosati* gives a thorough review of the solid state and photoelectrochemical characteristics of these materials. The section on surface morphology and its influence on the photoelectrochemistry is especially carefully written, and is followed by sections on photointercalation, behavior in non-aqueous electrolytes, and polycrystalline samples.

In summary the book contains a wealth of information on the most relevant semiconductor electrodes to date, written by some of the leading researchers in the field. There are only a few critical points to be addressed. A chapter on the intensively studied ternary chalcopyrites would have completed this volume. In addition, it would have been desirable to include also some authors from outside the United States, in accordance with the development and history of research in this area. The price of DM 340 appears too high for a book made by photographic reproduction.

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