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Book Review

The Primary Battery, Volume Two.
Edited by N. Corey Cahoon and George W. Heise, (The Electrochemical Society Series), John Wiley and Sons, New York–London, 1976, xvi + 528 pages, £21.

In the years 1935 to 1962 N. Corey Cahoon published a number of papers on the Leclanché battery. These papers, some of which have become classics, are characterised by careful planning, logical argument and intuitive insight. His chapter on 'Leclanché and Zinc Chloride Cells', which is the principle one of this volume, bears the same hallmark. It recreates the atmosphere of a formative era in Leclanché battery technology and will help others understand the addiction many scientists and engineers have for this electrochemical system.

In a few places the emphasis is questionable. Under the heading 'Description of Typical Leclanché Cells' (p. 3) there is no description of a paper-lined battery which probably accounts for 50% of world production, although space is found for the 'inside-out' construction which is interesting but now obsolete. There is little mention of the species present in the electrolyte solution; these have been comprehensively investigated by Sasaki and Takahashi (Electrochim. Acta 1 (1959) 261). Batteries with zinc chloride electrolyte are rather cursorily treated (p. 138). The attempt to reconcile the French and Mackenzie mechanism of 2-electron reduction followed by subsequent chemical reaction of Mn^{2+} ions with MnO_2 to give a 3-valent manganese oxide with Vosburgh's now generally accepted mechanism of 1-electron reduction to MnOOH may confuse those new to the field (p. 71). The section on leakage is particularly well done (p. 118 *et seq.*).

Corey Cahoon chooses his words carefully and the technologist who studies the chapter diligently will be amply rewarded.

Chapters on 'Magnesium Cells' by John L. Robinson and 'Aluminium Cells' by John J. Stokes, Jr. and David Belitskus follow. These are balanced accounts of the current status with both the advantages and the difficulties of these electrochemical systems given proper weighting.

The chapter on 'Organic Cathodes and Anodes for Batteries' by J. S. Dereska is difficult to read due to a complicated, descriptive, multi-adjectival literary style. The first part is an ambitious attempt to systematize the subject which does not quite succeed, perhaps because there are insufficient facts on which to anchor such a treatment. The examples considered in the second part are more informative and one wishes for more.

'Low-Temperature Aqueous Battery Systems' by J. W. Paulson, 'Thermal Batteries' by C. W. Jennings and 'Water-Activated Batteries' by D. J. Doan are competently executed chapters which help to establish the high informative

standard of the book. Minor criticisms are the omission of MnO_2 type from a figure depicting battery capacity as a function of temperature (p. 240), expressions of composition as percentage without specifying weight/weight or weight/volume (p. 241), use of the word depolarizer, an inference that depolarizer and cathode are different (p. 265–6), and a list of battery manufacturers that is entirely American (pp. 310, 364).

'Nomenclature and Testing Procedures for Primary Batteries' is awarded the status of a separate chapter and this is much commended. Although Walter J. Hamer does justice to the opportunity in many respects, it is regrettable that the chapter is so parochial and deals almost entirely with American practice. Reference is made to International Electrotechnical Commission (IEC) publications but the citations are out of date; two new editions and seven amendments have appeared since. There are a few errors in the chapter: 7-day test schedules are used in Europe as well as U.S.A. (p. 328), IEC does cover alkaline manganese batteries (p. 362) and the open circuit voltages given (p. 361) are not for mercury cells but for mercury cells containing a proportion of manganese dioxide.

'Reversibility of Battery Systems' by R. J. Brodd and R. M. Wilson covers secondary batteries. Although valuable and the work of experts it is out of place in this volume and cannot give secondary batteries in one chapter the depth of treatment applied to primary batteries over two volumes.

Contributions by Walter J. Hamer are always well organized and clearly written; this one on 'Internal Resistance of Primary Batteries' is no exception. Its inclusion is perhaps justified on the basis that it is such an obvious characteristic to investigate although few technological advances have resulted from such investigations.

The final chapter on 'Energy Conversion' by R. C. Shair discusses the basic principles of a multiplicity of power conversion systems. The busy industrial scientist will find the account invaluable when, due to a spate of publicity, he is called upon to explain to top management a 'new' power system and the effect of this system on the Company's established battery products.

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