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A Dream, a Challenge, Perhaps a Necessity

Fuel Cells and Their Applications

BY KARL KORDESCH AND GÜNTER SIMADER, VCH, Weinheim, 1996, 375 pages, ISBN 3-527-28579-2, DM 248.00

The development of each major type of fuel cell is comprehensively reviewed in this book, which begins with an overview of the current position. This is followed by chapters on general aspects of fuel cell systems and their basic thermodynamic principles. In Chapter 4, the main chapter, the electrochemistry of each fuel cell type is discussed, together with materials, cell designs and the performances for each type of cell. Readers requiring more detailed information on the science of fuel cells are directed to other publications by an extensive list of references at the end of this chapter.

Technological developments in alkaline fuel cells (AFC), of which Kordesch has long practical experience, are explained by reference to the activities of the industrial companies involved. Milestones in the development of other types of fuel cells are discussed in later chapters.

Chapter 5 describes stationary applications and concentrates on fuel cell applications in dispersed energy systems, while Chapter 6 covers on-site integrated energy systems and industrial co-generation. The transport applications of fuel cells in electric vehicles are covered in Chapter 7. This chapter concentrates mainly on historical activities, particularly those related to AFC; regrettably, more recent developments in the field of polymer electrolyte fuel cells (PEFC) are listed rather than analysed. No reference is made to small portable fuel cells as an alternative to batteries or generator sets.

One strength of the chapters on applications

is the use of high quality photographs, tables and diagrams, which complement the text. In general, sections covering PEFC applications are more up-to-date than those covering phosphoric acid fuel cells (PAFC).

In Chapter 8, the various fuels used for fuel cells are discussed together with methods of producing hydrogen from them. This chapter clarifies the value of considering fuel cells in terms of systems rather than as stacks alone. Chapter 9, the last chapter, summarises the worldwide state-of-the-art and looks to beyond 2000.

Although reference is made throughout the book to the role of platinum group metals as catalysts in low temperature AFC, PEFC, PAFC and direct methanol fuel cells (DMFC), it does not dwell on the catalyst science. The book concentrates mainly on materials, engineering, systems and applications. The sections covering solid oxide fuel cells do not include any references to recent developments which utilise platinum or ruthenium.

The authors suggest reconsidering the use of AFC for transportation applications, pointing out recent work which questions the established views regarding carbon dioxide sensitivity. However, industry is presently clearly focused on PEFC, while academic interest in PEFC alternatives is directed toward solid oxide and DMFC.

To conclude, this book reviews the last 25 years of fuel cell history. It is a valuable reference tool for those new to the field and an extensive review for the more experienced.

R.J.D.E.