

'From Electrocatalysis to Fuel Cells'

Ed. G. Sandstede, 415+XXV, University of Washington Press, Seattle & London for Battelle Seattle Research Center, \$12.50.

Fuel cells are less fashionable than they were a few years ago. Nevertheless, the Apollo moon landings could not have been accomplished without hydrogen-oxygen fuel cells, while in the U.S.A. the massive TARGET research programme, managed by the Pratt & Whitney Division of United Aircraft, has resulted in a number of 12.5 kW units fuelled by natural gas being tested in homes. These units produce AC electricity at 38% thermal efficiency—a very creditable figure.

The fact that fuel cells have failed to live up to the expectations of the optimists of ten years ago is perhaps more a reflection on the optimists than the fuel cells.

Partly because of difficulties encountered with fuel cells, a significant amount of electrochemical effort has been diverted into secondary batteries using couples offering the possibility of higher power and energy densities than the conventional lead/acid battery. Success in this direction has been, if anything, more elusive than that for fuel cells.

In both fields, batteries and fuel cells, the research worker is faced with a choice between solving difficult electrochemical problems with aqueous electrolytes at relatively low temperatures (from ambient to 200°C or thereabouts) and difficult engineering problems at higher temperatures which may range between 300° and 1000°C or even higher. That is not to say that the engineering problems of low temperature fuel cells and batteries are negligible, or electrochemical problems in high temperature batteries non-existent. To date, the only practically useful power systems employing the fuel cell principle have all used aqueous electrolytes.

The present volume consists of a number of papers presented at a three-day meeting which took place in Seattle prior to April 1971. The introductory chapter is by the Editor who, in the reviewer's opinion, over-emphasizes biological

processes and their relevance to fuel cell catalysis and is in general too brief for the uninitiated to follow and unhelpful for the informed. Some thirty-four papers then follow, together with summaries of the discussions prepared by the eight session chairmen. The topics covered by this volume cover a range of subjects related to fuel cells, including 'implantable' fuel cells which are intended to generate electricity directly from reactants within the bloodstream in order to power cardiac pacemakers or other electrically driven prosthetic devices. Additionally, some reference is made to battery developments. In the final section of the book various authors contribute a series of chapters on development goals and prospects: as well as more practical aspects of the subject, this includes a stimulating chapter by Professor Bockris and co-workers on some basic aspects of electrocatalysis.

It is a great pity that the Editor has been unable to include an authoritative statement on the TARGET programme. To talk about the current state of fuel cells without full reference to this topic is like trying to play 'Hamlet' without the Prince of Denmark. Indeed, as is perhaps inevitable when making a book out of a series of papers, the reader is struck by an unevenness in both presentation and content. In some cases the reader may be misled as, for example, by the chapter on Raney catalysts, which omits to quote the specific quantities of precious metals used in the examples. From other references one would judge that these were of the order of 200 mg cm⁻², which is impractically high. On the other hand, the chapter on organic catalysts for oxygen production is a useful summary of the situation. The chapter on thin film fuel cell electrodes attributes electrodes formed by evaporating metals onto microporous substrates to Cahan, whose work was considerably antedated by a number of publications from Thornton Research Centre.

Lack of balance is also evident in the three chapters on high temperature fuel cells, which omit any description of fused carbonate cells

which at the moment seem less unpromising than the solid oxide cells.

Although this book cannot be recommended to the uninitiated, those actually involved in fuel cell research will find that it contains some useful

titbits of information and the relatively modest price, for these days, will encourage teams active in the field to add this volume to their libraries.

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