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0521599490 - Solid State Electrochemistry - Edited by Peter G. Bruce

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This book describes for the first time in a modern text the fundamental principles on which solid state electrochemistry is based. In this sense, it is distinct from other books in the field which concentrate on a description of materials. The text provides an essential foundation of understanding for postgraduates or others entering the field for the first time and may also be of value in advanced undergraduate courses.

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Chemistry of Solid State Materials

Solid state electrochemistry

Chemistry of Solid State Materials

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Solid state electrochemistry

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*Dedicated to Margaret, David and Caroline, for their
friendship, support and patience*

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Preface

Significant advances in our understanding of solid state electrochemistry have taken place over the last 30 years. The subject has grown rapidly and is, as illustrated in Chapter 1, much closer to the more established electrochemistry in liquid electrolytes than at any time since Faraday's pioneering work in both fields some 150 years ago. Although several books have appeared dealing with ionically conducting materials from a structural point of view, very few texts are available which describe the physical electrochemistry of solids. The present textbook aims to present the fundamentals of solid state electrochemistry with a strong emphasis on the physical aspects. It is directed primarily towards postgraduate students and other scientists and engineers entering the field for the first time, as well as those active in the areas of batteries, fuel cells, sensors and electrochromic devices, topics for which solid state electrochemistry makes a major contribution. Although the reader requires little prior knowledge of solid state electrochemistry, the subject is treated at a relatively advanced level and therefore significant sections of the book should be of interest to all electrochemists, as well as those already active in the electrochemistry of solids. The structural and material aspects of the subject are not ignored, indeed some knowledge of the most important solid electrolytes and intercalation electrodes is an essential foundation on which to build an understanding of the physical properties.

Despite strenuous efforts by this editor to avoid overlap of topics at all stages in the production of the book, it is inevitable in a multi-author text that some topics will be addressed more than once. In general where overlap has been permitted to remain the treatment of the topics is quite distinct, either in depth or approach. For example, both Chapters 2 and 3 deal with crystalline solid electrolytes: West provides an excellent introduction to the field and describes the key materials in Chapter 2,

Preface

while the contrasting and distinctive approach to the description of ion transport by Goodenough provides the reader with a consistent and advanced framework for thinking about electronic and ionic transport, which many will find stimulating.

In a subject with the breadth of solid state electrochemistry, and with the inevitable constraints on the length of a textbook, some topics have been omitted. In particular, less emphasis on proton conduction has been given than on the transport of other ions, in part because of the existence of a recent book on this topic in the same series, *Proton Conductors*, Ed. Philippe Colomban, Cambridge University Press (1992). Also the important topic of intercalation into graphite has been largely omitted. Several excellent texts on this subject are already available.

Finally, I am indebted to all the authors who have contributed to the book. In the present climate of research it is increasingly difficult to find time to write for a work such as this. They have borne my pressure with patience and good humour.

St Andrews

Peter G. Bruce