NEWS

Book review

Irreversible thermodynamics: theory and applications
F. S. Førland, T. Førland and S. K. Ratkje
Wiley, Chichester (1988)
281pp. £45.

Irreversible thermodynamics as described in this book deals with the extension of classical thermodynamics to linear transport processes near equilibrium. This has become a classical field itself with the Onsager reciprocal relations, which lie at the heart of the theory, having withstood critical experimental testing. The theory is indispensible when describing simultaneous transport of more than one type and the coupling between transport processes. It has been widely applied in recent years to the many natural phenomena and chemical systems which exhibit near-equilibrium behaviour. This book does not deal with the non-linear, far from equilibrium thermodynamics to which Prigogine has notably contributed in recent years.

It is over twenty years since Katchalsky and Curran's text first brought the somewhat esoteric field of irreversible thermodynamics within reach of chemists and biologists, many of whom had been deterred by the formalism of such texts as de Groot and Mazur. This book owes a considerable amount to Katchalsky and Curran. It is also aimed at senior level students but commedably develops the basic equations of the theory for simple systems at a lower level of mathematical formalism.

The book is divided into two sections. The theoretical foundations are developed in Part I with an introductory chapter and chapters on entropy production, the flux equations, transport processes in concentration cells, transport processes in ion exchange membranes, systems with temperature gradients, and systems in gravitational or centrifugal fields. A knowledge of classical thermodynamics is assumed and the reader is led through the basic theory in less than forty pages before applying it to sample systems.

Part II covers selected applications with chapters on the emfs of cells with liquid junctions and with membranes, the transport properties of a cation exchange membranes, energy conversion in biological systems, and non-isothermal transport. These chapters also contain significant theoretical development and here the divison of the book into theory and applications begins to weaken. Also, there is sufficient common ground between three chapters in Part I and three in Part II to further question this divison.

The book has merits as a teaching text with each chapter providing several excercises to reinforce the theory. Numerical answers to the excercises are listed in an appendix. Sections dealing with transport processes in electrolyte solutions, electrochemical cells, and membranes are more fully developed, reflecting the authors' interests. Although SI units and IUPAC recommendations for symbols are largely employed, the persistence of the faraday (mole of elementary electric charge), the equivalent and the use of potential instead of potential difference are noticable deviations.

This is a useful introductory text to irreversible thermodynamics for students of chemistry, chemical engineering and biology. Apart from a fairly concise coverage of the theory and some selected examples of its application, the book also contains sufficient peripheral material of interest to enhance its readability among today's students. However, the price will deter student purchases.

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