

the use of electrolytic polishing in studying the mechanism of electrolysis and the valence of ions by I. Epelboin, and an article by M. Haussinsky on applications of radioactive methods to the study of surface states and surface reactions.

A section devoted to potential- ρ H diagrams contains a progress report of Commission 1 by M. Pourbaix, and eight papers containing potential- ρ H diagrams for the following metals, or systems, at 25°: Fe, Cd, Co, and the systems Fe-CO₂-H₂O and CN-H₂O by E. Deltombe and M. Pourbaix, the systems Ti-H₂O by J. Schmets and M. Pourbaix and Mn-H₂O by A. M. Moussard, J. Brenet, F. Jolas, M. Pourbaix and J. Van Muylder, and the electrode Pt, S/S₈²⁻ at 20 and 25° by G. Maronny and G. Valensi. These are followed by ten articles under the heading polarization curves and electrochemical kinetics. One of these on the temperature dependence of the activation energy of electrochemical reactions, by F. Gutmann and L. M. Simons, is theoretical. The remaining nine contain original experimental data, or curves. B. E. Conway, J. O'M. Bockris and B. Lovreček report the effects of alkaloïds on the rate of evolution of H₂ at cathodes of Hg and other metals. H. J. Reiser and H. Fischer present polarization-current curves for the simultaneous deposition of H₂ and Ni, and conclude that the rate-determining stage in H₂-deposition is the recombination of H to H₂, catalyzed by Ni. H. Fisher, M. Seipt and G. Morlock make an oscillographic study of the polarization of the deposition of Ni by measuring the variation in overpotential during short rectangular current pulses. G. B. Adams, M. Maraghini and P. Van Rysselberghe describe methods for measuring the thickness of very thin growing films of ZrO₂. These methods should be serviceable in studying the effects of numerous variables upon the ionic current responsible for oxide film growth. Activation polarization in the electrodeposition of Cu is studied by E. Mattsson and R. Lindström, and they explain why the rate-determining step in the deposition depends upon current density. L. Gierst and L. Bourgeois present experimental curves and survey the kinetics of the passivation of Hg, and A. Ruis, J. Llopis and F. Colom do this for the effects of alternating current on the overpotential of O₂ and some anodic oxidation processes. This section is concluded with short papers concerning the electrolysis of NaCl with a mercury cathode. M. Dodero and M. Behroun discuss the copious evolution of H₂, and M. Dodero, C. Deportes and R. Mayoud present the potential- ρ H diagram and polarization curves for the electrolysis.

The last half of the book is concerned with practical applications of electrochemical thermodynamics and kinetics, and with polarography. Nine papers deal with corrosion. This subject is introduced with a statement of the aims of the study group on corrosion, and with a discussion of definitions, classifications and nomenclature used in the description of corrosion-inhibition and inhibitors. The careful experimental work of A. Ruis, J. Llopis and F. Colom on superimposed alternating currents is extended to the anodic corrosion of Pt. R. Olivier contributes a long and important paper on the passivity of Fe-Cr alloys, including 18/8 stainless steel. J. Van Muylder and M. Pourbaix present two papers on the electrochemical behavior of lead and its corrosion and cathodic corrosion protection, and A. M. Abd El Wahed and M. Pourbaix explain the use of polarization curves in studying the corrosion and protection of Fe in the presence of chlorides. M. Serra and S. Feliu present data on the anodic passivation of Fe in sulfate solutions, and discuss several processes which can explain its origin. M. Billy and G. Valensi report an interesting and careful kinetic study of the formation of β -silver sulfide, and discuss its bearing upon the phenomenon of electrochemical corrosion. The electrochemistry of Mn is emphasized in papers under the supervision of Study Group 2 concerned with batteries and accumulators. K. H. Maxwell and H. R. Thirsk contribute an exhaustive study of the relation between preparation and structure of MnO₂ and the e.m.f. of cells containing the MnO₂ electrode. An interesting controversy results from the juxtaposition of a paper on the thermodynamics of the MnO₂ electrode by J. Brenet and a paper by the same author and A. M. Mousard on the variability of the potential of this electrode in practice.

The applications of polarography to analytical chemistry are outlined by P. Souchay, and a renewed Hg cathode is shown by H. Coriou, J. Dirian and J. Hure to permit a practical separation of traces of Mn from relatively large

amounts of electrolytes. M. A. El Guebelly shows that this electrode can also be used in the determination of Ru in extremely dilute solutions, because the concentration of Ru is proportional to the velocity of H⁺ ion discharge which it catalyzes. New developments in polarography and voltammetry are reviewed by P. Delahay. The volume is concluded with a collection of important but somewhat unrelated papers. The conditions for electrolytic reduction of salicylic acid are investigated by H. V. K. Udupa and B. B. Dey, and the conditions and mechanism of the electrolytic preparation of cyclobutanol are discussed by R. Le Corff and F. J. Taboury. Two papers are concerned with the mechanism of reduction at the Hg cathodes. The reduction of CO₂ is considered by T. E. Teeter and P. Van Rysselberghe, and H₂O₂ is studied by G. A. Murdock and P. Van Rysselberghe. The mechanism of electrolytic polishing is discussed by S. Feliu and M. Serra. A cryoscopic study is reported by Y. Doucet, who investigated the thermodynamic behavior of mixtures of fused salts.

Although a part of the volume is necessarily devoted to reports and the plans of committees and study groups which may not be of interest to the general reader, some 500 pages contain a wealth and variety of original contributions, and many of these are largely experimental. The International Committee for Electrochemical Thermodynamics and Kinetics is to be congratulated for making the results of such work available in this convenient and well-organized collection.

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Electrochemical Affinity. Studies in Electrochemical Thermodynamics and Kinetics. By PIERRE VAN RYSSELBERGHE, Professor at the University of Oregon, Eugene, Oregon. Hermann and Cie, Editeurs, 6 Rue de la Sorbonne, Paris 6, France. 1955. 109 pp. 16 × 24 cm. Price, 1250 French francs.

The theme of this booklet is "that a rational treatment of electrochemistry requires the use of the thermodynamics of irreversible processes and that this discipline, although not new by any means, is still unfamiliar to the majority of physical chemists and electrochemists." For this majority it can be stated briefly that the thermodynamics of irreversible processes comprises a generalized description in which reversible processes and equilibria are limiting cases. To the majority this may not appear novel or profound. Nevertheless, the thermodynamics of irreversible processes is a profound subject with much of its modern development based on Onsager's reciprocal relations together with the use of concepts such as the degree of advancement of a reaction and the power of irreversibility introduced by De Donder and extended by Van Rysselberghe.

The topics discussed are limited to the theory of galvanic and electrolytic cells, electrode processes, polarization, overpotential, electrochemical kinetics and thermo-electrochemistry. In essentially the same form a portion of this material has been presented by Van Rysselberghe in the *J. Phys. Chem.* 57, 275 (1953). This article on electrode phenomena and the thermodynamics of irreversible processes exhibits the same scholarship and style so precisely that it can serve as an illustrative review and partial replica of the material in this brief but interesting book.

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E. R. SMITH

Blood Group Substances. Their Chemistry and Immunology. By ELVIN A. KABAT, Departments of Microbiology and Neurology, College of Physicians and Surgeons, Columbia University; and Neurological Institute, Presbyterian Hospital, New York. Academic Press, Inc., Publisher, 125 East 23rd Street, New York 10, N. Y. 1956. ix + 330 pp. 16 × 23.5 cm. Price, \$8.00.

The author of this very worthwhile book brings to his task a profound knowledge of immunochemistry and also a long experience in the field in which the A,B,O blood group system forms a useful model. Much of present day knowledge in immunology and chemistry of antigens and antibodies has been obtained by study of this system.