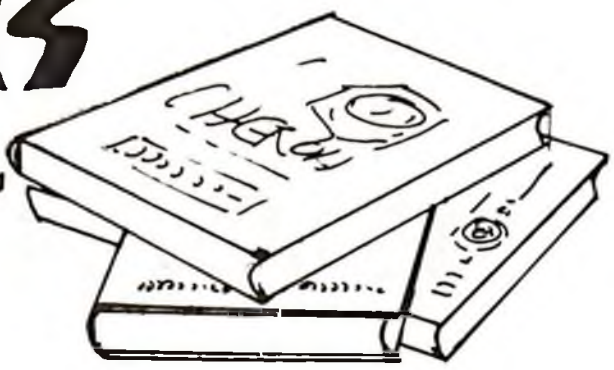
Books section



"Production Gas Carburising by G. Parish & G.S. Harper Pargamen Press

After an introductory chapter, five chapters deal with fundamentals of heat treatment and design considerations for carburising. In the chapter dealing with reasons for case carburising, excellent consideration of stresses and their distribution on case hardened parts has been given. The advantages gained in increasing the fatigue limit of engineering component by this treatment as against through hardened parts are indicated. The conditions under which contact damage and wear cause failures, and the beneficial contribution by case hardening in combating such failures are discussed here.

Fundamentals of heat treatment of steels have been dealt with, in chapters 3 and 4. This would be useful for persons who "may not have a technical background".

The subsequent chapter, on residual stresses is supplementary to the earlier one dealing with the mode of development and nature of residual stresses during case hardening. The chapter on design consideration takes into account all aspects of design of case hardened parts such as material, process, economic aspects in choice of material etc.

The next portion of the book, is devoted to theoretical as well as practical aspects of gas carburising. It starts with theory of gas carburising, in which various gas-metal reactions, responsible for carburising / decarburising, atmosphere control, oxidizing and reducing reactions have been explained. Various types of atmospheres with particular reference to their effects and also carbon potential curves, diffusibility relationships, effect of alloying elements on response to gas carburising, and their diffusion coefficients have been extensively dealt with. The following three chapters deal with the practical aspects of gas carburising, which can be considered to be the most useful portion of the book, for production personnel. A detailed discription of endothermic generators their control, applications have been given. A few curves indicating dew point for endothermic atmospheres are given. The effect of hydrogen sulphide on such atmospheres have been indicated. Drip feed atmospheres has been dealth with. Illustrative relative costs of both endothermic and drip feed installations have been worked out.

Methanol readily cracked at the carburising temperature, and provide carbon monoxide hydrogen atmospheres similar to that obtained by endothermic generators. Development of carburising atmosphere, by B.O.C. Ltd., using methanol has been considered in detail. Addition of appropriate amount of nitrogen allows the complete synthesis of an endothermic atmosphere. It has been indicated that while maintaining the quality as that in carburising with an endothermic atmosphere, economy of 50% can be achieved with this new system.

Carbon potential control, based on dew point, use of infrared analyser, and the more recently developed oxygen probe have been discussed in detail. The working principles have been fully explained. Chapter 9 deals with the various parameters of process control and contains a good number of illustrative graphs/curves. Different types of processes viz single stage, boost/diffuse method etc. have been discussed, with illustrative graphs. Chapter 10, deals briefly with Furnaces

and equipment. Conventional precarburising heat treatments such as normalizing, annealing etc., and post carburising heat treatments such as hardening, tempering, subzero treatment have been dealt with in the next chapter. Different types of quenching for achieving desired results have been discussed.

Chapter 12 deals mainly with quality control, starting from the stage of material acceptance to final inspection. In-process testing methods, by introducing test pieces for assessing core properties, case depth, carbon gradient, metallurgical structure have been covered. Chapter on distortion deals thoroughly with various factors, contributing to distortion and dimensional variation in parts during case hardening and various controls to be excercised for minimising such defects. Press quenching has been discussed. This is followed by a chapter on micro structures in case hardened surfaces, wherein, decarburization, carbide segregation, retained austenite have been dealt with.

It is a special feature of the book that a complete chapter on aspects of safety has been included which would be useful guidance for practical heat treaters.

In the concluding chapter a relevant question has been posed. Premature failures of case hardened parts have generally been found to be for reasons other than materials or the carburised quality. So could there be a posssibility of practicing over engineering in these aspects?

On the whole, the book is an excellent treatise on the subject and useful to students of metallurgy, and in particular to practical heat treaters.

T.G. Shamanna

Electrochemistry in Research & Development. Edited by R.Kalvoda & Roger Parsons Plenum Press New York PP 299 with Index.

This publication is a record of the papers presented and discussed at the UNESCO Scientific Forum on Chemistry in the Service of Mankind - Electrochemistry in Research & Development, held in Paris during June 1984.

The general introduction by Prof. Vicek and Prof. Gierst is followed by three introductory talks by Prof. Parsons, Prof. Despic and Prof. Hackerman. The two general introductory lectures deal with the scope of Electrochemistry in Research and Technological developments and dwell on the role of UNESCO in promoting education, science and culture on a global scale. Prof. Parsons gives a historical review of the progress of the Science of Electrochemistry during the 19th & 20th centuries. Prof. Despic covers the industrial applications of electrochemistry in diverse fields such as electroplating and surface finishing, electrochemical machining, electrochemical power sources, electrochemical analysis, or synthesis and electrowinning with specific illustrations of newer developments in chlor-alkali and aluminium industries. Prof. Hackerman refers to the historical developments in various applications and the importance of understanding of the basic science and its relevance to technology and ultimate application.

These introduction lectures are followed by papers presented & discussed in Four Sections. The first section on 'Electrochemistry and Energy' consists of four papers. The first on 'Solar Energy Conversion through Photoelectrochemistry' by Prof. Bard covers the role of semiconductors & their possible application in photochemical cells. Typical instances of integrated chemical systems & the future trends in application as in Fuel production, water purification, photofertilization, photo synthesis, & photo catalysis are discussed. Prof. Wissener lists the application of Electrochemical power sources in three fields : Generation, storage and transport of electrical energy, and briefly indicates its scope in these areas. Prof. Bagotsky ,covers briefly the historical background, followed by the development of the primary & storage cells including the modern trends towards better performance & shelf life, specific applications as in fuel cells, high energy batteries & large scale power systems Prof. Dell discusses the development of hydrogen fuel cells, and the controversial future role of hydrogen as the fuel, as also in major chemicals manufacture like ammonia, petrolium refining & methanol synthesis. The possible applications of hydrogen as transport fuel in aviation & road vehicles are highlighted. The design of fuel cells such as the phosphoric & alkaline (KOH) types and their relative merits is very well discussed. Each presentation has been followed by a critical evaluation of the information & data furnished by the speakers & a resume.

The Second Section on 'Electrochemistry &

Environment' opens with a paper by Prof. Kalvoda. With a brief introduction on the scope of the techniques in environmental electroanalysis the speaker deals with Polarography & Voltammetry in detail with specific instances. He also covers differential pulse polarography(DPP). Anodic stripping voltammetry (ASV) and the development of single purpose analysers as for monitoring gases. Development of High performance liquid chromatography and ion selective electrodes (ISE), using various types of semiconductors such as MOSFET, ISFET, CSFET, is indicated. The uses of Coulometry, Conductometry, their limitations briefly discussed. Application of various techniques in analysis of waters air, & removal of pollutents is expalined, in detail. The paper is a very lucid exposition of the various instrumental methods in electrochemical analysis.

In the second paper in this section Prof. Nurnberg specifically deals with the application of voltammetry in Ecochemistry of metals, for trace metals emphasising its low cost. Various applications of the method in analysis of natural waters, oceans & coastal waters, estuaries, rivers & lakes, drinking water, food & biological environmental materials are discussed with relevant data. The next two papers relate to Drug and food control analysis. The first one by Prof. Volke on 'Elecrochemistry in drug & food control' covers, in detail pulse polarographic methods (DPP) and the use of static mercury drop electrode (SMDE) in polarograpy, and discusses their utility and limitations in specific applications in pharmacology & pharmaceutical chemistry. The importance of HPL and the relative merits of EC & UV detectors in HPLC detection modes have been discussed. Prof. Oelschlager also deals with electroanalytical methods in pharamcy & food control' and stresses the application of diffrential pulse polarogaphy in pharmaceutical analysis. In Vitro, and in ViVo, with specific procedures in application. Use of this method in food control and the precaution to be taken in sampling are stressed. The two papers contain valuable information for analysits in the food & pharmaceutical research & industry.

The third section is on 'Electrochemistry in Biosciences'. First Prof. Theverot deals with various types of sensors useful in analysis. The paper discusses Coulometry and the use of ion selective electrodes(ISE), Gas electrodes(GSE) and Enzyme cell electrodes of which the last is the most complex one. Application in IN VIVO studies are discussed & the main characteristics of Bioelectrochemical sensors are tabulated.

The second paper by Prof. Wightman on ' IN VIVO electrochemistry' again discusses the various types of IN VIVO sensors like potentiometric sensors, and amperometric and voltammetric electrodes. Applications of these in the study of Neuronal tissues IN VIVO, the use of carbon fiber as microvoltammetric electrode are discussed. The possible use of these electrodes in control of IN VIVO processes is indicated.

Papers by Prof. Hurwitz & Prof. Chizmadjev are devoted to 'Memebranes'. The first is a brief introduction to memebranes, Prof. Chizadjev discusses the research conducted at three levels Viz; Molecular Cellular, & Organism. The studies described include, equlibrium electrochemical properties of Lipid Biolayers, membrane transport covering transport of hydrophobic ions, ions induced by ionphores and transport through protein systems, obtained from cellular membranes and built in biolayers. Other topics covered include electric breakdown osmotic Lysis & Fusion.

The next paper by Prof. Berg 'On Electromagnetic field effects on cell membranes & cell metabolism' discusses the effects of single & periodic electric field pulses on cell as also the magnetic influences on tissues in relation to biotechnology and medicine. This section contains a wealth of information on the application of electroanalytical techniques in Biosciences.

The last section is on 'Electrochemistry in Technology' Prof. Budevski in his paper on 'Potentialities of new Technologies' briefly discusses the new innovations in cell design. Use of materials as in fuel cells, chlor-alkali cells and other regeneration & recovery systems as in metal winning etc. are examined and the current trends indicated.

The next paper by Prof. Silvestri stresses on the petrochemical industry and fine chemicals production, particularly industrial electro-organic processes. The prospects and limitations are highlighted. Paper on'Industrial applications' by Prof. Fleischmann & Prof. Pletcher covers a wide range of topics particularly with references to cell design in electrochemical engineering, its importance in numerous applications in metallurgy, organic & inorganic 'synthesis, process technology, energy storage & conversion, effluent treatment, corrosion protection & analysis. Developments in basic electrochemis-

try as in the study of structure of electrode/solution interfaces and adsorption and particularly the use of surface Enhanced Raman Spectra(SERS) in these studies are covered in great detail.

The last paper in this section is on 'Polymer Electrodes' by Prof Murray. He discusses the various classes of polymer electrodes with fixed electroactive groupings, ion exchange polymer films with electroactive counter ions, those with fixed coordinating sites for Redox metals or ligands, & those with significant electronic conductivity. Among the non-electroactive polymer films electro analytical sensors, corrosion inhibitors, cell separators, have received special mention. The role of such polymer films on electrodes in industrial applications are stressed.

The papers in the publication cover a wide range of research & development studies and industrial applications. Though inevitable as in presentations there has been an over lap in the subject matter of the papers in some presentations. The discussions have been documented.

This publication gives a good perspective as to the role of Electrochemistry in a broad spectrum of industrial activity covering metallurgy, industrial chemistry both organic & inorganic, biology and pharmacology. It is a valuable addition to a technical library of institutions engaged in research in these respective areas.

J. Balachandra

C O N S U L T A N C Y C E L L

The Electrochemical Society of India has a consultancy cell with a panel of experts from among the active members of the society.

The society offers consultancy for problems pertaining to Electrochemical Industries and problems dealing with effluents .

The society undertakes the responsibility of sorting out the problem identifying the consultant, executing the work and providing the technical report.

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