Books section



ELECTROCHEMICAL DETECTORS - FUNDAMENTAL ASPECTS AND ANALYTICAL APPLICATIONS , Ed.T.H.Ryan, Plenum Press (1984), 172 pages.

This volume is the proceedings of a symposium sponsored by the Analytical and Faraday Division of the Royal Society of Chemistry held at Chelsea College, London on 15-16, September (1981). This symposium was the fifth event in the biannual Angle-Czech symposea in Electyrochemistry and contributions are nearly equally shared by scientists of U.K and those of J. Heyrovsky Institute of physical chemistry and Electrochemistry.

The volume consists of eleven different articles, but all have the common focus of electrochemical detection as a practical chromatographic tool. They deal with topics such as 'The new electro analytical techniques used in medicine and biology', by W. John Albery and Barry G.D.Haggette 'Use of HPLC with electrochemical detection in clinical chemistry', by Douglas A. Richards, 'Electrochemical detection in HPLC in a natural product problem' by Roger M. Smith, 'Voltammetric detectors for HPLC and other flow through systems' by Antonin Trojanek, 'Electrochemical detector using a static mercury drop electrode' by W.J Van Oort. J. Dem Hatigh and R.J. Driebergen 'Electrochemical sensors and detectors using renewable electrode surface' by Jiri Tenygl, 'Voltammetry of organic molecules at solid electrodes' by Jiri Volke, 'Application of immiscible electrolyte interface in analytical chemistry' by Vladirin Mqracek, 'Electrochemical oxidation as a detection technique in HPLC' by A.J. Samuel and T.J.N.Webler , 'Tensammetry in combination with adsorptive accumulation of surface active compounds on electrode surface' by Robert Kalvoda and the Impedence of small Li-CuO primary cells' by R. Leek, SAGR Karunathilaka, N.A. Hamson and J.J. Sinclair.

The articles are easily readable and the subjects have been dealt with authoritatively with suitable illustrations and references. The get up of the book is quite good but some avoidable typographical errors have crept in. The book however is quite useful. This would be a very useful addition to all specialists working in this field.

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ELECTROCHEMICAL CELL DESIGN.

Ed. Ralph E. White 389 pp.with index. Plenum Press N.Y.

The book is a collection of papers contributed to a national meeting held in Texas in 1983. The contributions of both a theoretical and practical nature cover a wide range of electrochemical engineering topics with particular reference to design of electrochemical cells.

There are nineteen papers. Of these eight papers cover the design and developmental features of different types of chlor-alkali cells from the earlier diaphragm and mercury cells to the latest membrane cells.

The first paper by S.N. Chatterjee is a comprehensive genral review of the development of chlor-alkali cells containing all relevant details regarding design capacity, quality of product and other details of various manufacturers.

The next paper by the editor himself contains a theoretical discussion of a simple model of a diapharagm type chlorine cell introducing the concept of MaC Mullan number which is the ratio of resitivity of the electrolyte filled diaphragm to the electrolyte. The product of this factor and the thickness of the diaphragm is shown to be an important factor.

Simmrock has presented two papers the first one discussing the design principles for chlorine membrane cells using perflourinated cation exchange membranes. Several designs like membrane gap, and solid polymer electrolytes local chemical

component of voltage drops and means of minimizing them.

The paper by M. Seko et al. discusses in detail the design features and operating characteristics of their Asahi cells, using perfluorocarboxylic acid membranes and the multilayer membranes using perfluorosulfonic acid, their relative merits and utility. Other types of electrolysers of Asahi chemicals are briefly referred to.

Another short paper in this group is by A.Bjareklint et al. on the design of EC modularized electrochemical cells. The EC electrochemical Cell(ESC) and EC Multipurpose cell (MP) are according to them useful for laboratory, pilot plant and small scaleproduction testing for evaluation of the efficiency and other parameters relating to the process.

Two papers cover the application of electrochemical process for Organic synthesis. The first one by R.D. Goodin et al. discusses the experiences with a bench scale electrochemical plant with particular reference to desulfurisation of Methyl benzyl sulfide to produce toulene derivatives. The process development and the bench scale operation are discussed. The second paper by R.E.W. Janson discusses the relative importance of various factors to produce electro-organically sunthesised products and summarises the economic driving forces on electro-organic synthesis.

The paper by W. Sambaher discusses electrochemical techniques for the extraction of heavy metals in industry. The several concepts, apparatus, and costs involved with particular reference to waste treatment are considered. Details of the SANDOZ electrolysis reactor which uses packing bed columns are given. A typical case of treatment for recovery of copper from dyestuff effluents is presented.

The second paper is on the design and application of rotating cylinder electrode technology to continuous production of metals by N.A. Gardner & F.C. Walsh. The paper discusses the development of the rotating cylinder electrode, its various design features, from simple to more sophisticated reactors and the range of applications with particular reference to the ECO cell. The applications cover effluent treatment, hydrometallurgy, recovery and refining of metals.

Two papers by P.G. Grimes et al. cover the theoretical aspect of effect of shunt current and its control in electrochemical systems and its application in the design of Zinc-Br batteries, using shunt presentation of a simple models of EXXON's zn/Br battery by J. Van Zee et al. and the maximum attainable efficiency being over 75%.

Four papers basically of theoretical nature discuss various mathematical derivation approaches useful in the design and operation of cells. The first is the finite element model of bipolar plate cells by J.H. Holmes et al. using Laplaces equation and the finite element technique. The second by K.H. Lim & E.I. Frances discussed the effect of migration/diffusion of electrolytes resulting in change in the overall ohmic resistance of the electrolyte. The typical case discussed is of the solution of 1.5mM sodium di-(2-ethyl hexyl) sulfouccinate with zinc electrodes.

W.G. Sunu in his paper, Mathematical model for design of battery electrodes with reference to lead acid cell modelling discusses a one-dimensional porous electrode model to predict all the parameters related to cell operation and compares with experimental data.

The last paper by J. Van Zee et al. is a complete discussion of the extension of New man's Numerical Technique to Pentadiagonal systems of equations.

The publication contains a wealth of information for designers of electrochemical cells and will be a good acquisition for a chemical and electrochemical technological library.

Resume of the Short Term Course, on Coating Technology - COATTECH '85 held at Bhabha Atomic Research Centre, Bombay on January 23 to 25, 1985. Dr. M.K. Totlani, Metallurgy Division, BARC was the course co-ordinator.

The past two decades have witnessed remarkable progress in the field of materials development. This has been mainly due to the advent of high technology. Because of severe operating conditions, now exacting standards have to be maintained in the matter of materials selection. Although the R&D efforts have led to the development of a host of new materials with vastly improved properties, the problem of producing a single material with the right set of properties to fulfil its functional requirements, still remains to be solved. The main reason for this lies in the fact that the material for high technology applications has to have a combination of widely different properties, which are practically difficult to produce by conventional processes. It is in this context that the coating Technology assumes great importance. The attractive feature of a suitable coating is that the bulk of the material retains the original properties and surface properties alone are modified to suit the functional requirements.

Satisfactory performance of coated components depends to a very large extent on the proper choice of coating technique and the methodology adopted. Failure to select a correct coating treatment can lead to unsatisfactory or even disastrous results. It is thus essential to have a thorough understanding of all the available coating techniques, thier main characteristics, capabilities and limitations. Bearing this in mind, a Short Term Course on 'Coating Technology - COATTECH '85' was organised by the Bombay Chapter of the Indian Institute of Metals at Bhabha Atomic Research Centre, Bombay between January 23 to 25, 1985. The course was co-sponsored by Naval Chemical and Metallurgical Laboratory, Bombay, Metal Finisher's Association of India, Bombay, M/s. Delta Chemicals, Bombay, M/s. Grauer and Weil (I) Ltd., Bombay, M/s. Metallizing Equipement Pvt Ltd., Jodhpur and Progressive Chemicals Corpn., Bombay. Over 60 participants (engineers, designers and scientists) from various industries, R&D laboratories, and academic institutes attended the course.

Shri. C.V. Sundaram, Director, Reactor Research Centre, Kalpakkam delivered the Inaugural Address. He pointed out that many exciting technological developments in the coating technology have taken place in recent years to meet the challenging requirements of high technology areas. He cited a few examples from nuclear engineering and aerospace, where the use of appropriate coatings have facilitated superior performance and conservation of materials. Shri. Sundaram also pointed out the need of quality control in coating technology.

Prof. P. Rama Rao, in his Key-note address covered very elegantly the important aspects of coating technology and discussed in detail the development of coatings for gas-turbine engines, where the problem of high temperature wear and corrosion are very severe. Prof. Rama Rao pointed out that the processes like physical vapour deposition (PVD) and chemical vapour deposition (CVD) of surface coatings, are being increasingly applied, on an industrial scale, for wear and corrosion protection of functional sufaces. Their use had so far been restricted to areas like electronics and optics.

Shri. H.C. Katiyar, Chairman IIM Bombay Chapter presided over the Inaugural Session. Shri. K. Balaramamoorthy, Director, Materials Group, BARC and Chief Executive, Nuclear Fuel Complex, Hyderabad, welcomed the participants Dr. M.K. Totlani, Convener, COATTECH '85' proposed the vote of thanks.

Lectures during the course were delivered by experts drawn from industry, R&D laboratories and academic institutes and covered almost the whole range of coating techniques and also testing of coatings. The topics were, Organic Protective Coatings, Electrostatic Powder Coatings, Nitriding, Carburizing, Thermally Sprayed Coatings, Plasma Weld Surfacing, Ion-implantation, Chemical Vapour Deposition, Physical Vapour Deposition, Electroplating, Selective Plating, Electroless Plating, Chemical Conversion Coatings, Anodizing, Surface Analysis, Evaluation of Coatings and Coatings for Solar Applications. All the lectures were compiled in a book form and given to every participant at the time of rgistration. This is the first time that all the coating techniques, which involves imputs from organic chemists, electrochemists, physicists, metallurgists, chemical and mechanical engineers, were discussed at the common platform.

On the concluding day, there was a Panel Discussion chaired by Dr. M.K. Asundi, Head, Physical Metallurgy Division, BARC, Bombay with Panel Members drawn predominantly from industry. The discussions clearly indicated the inter disciplinary nature of the field and the requirement of sustained R&D to develop cost-effective coatings to meet the stringent functional requirements for requirements for high technology applications.

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