ABSTRACTS

1. **Some principles of electrochemical fuel-cell design —**

M. Eisenberg (Electrochimica Acta, **6,** No. 1-4, 93, 1962). This paper considers some electrochemistry and the electrochemical engineering principles for design and optimization of fuel cells. The design methods are illustrated by an optimization study for a 50-cell hydrogen-oxygen fuel-cell system.

2. **Studies on reserve battery IV. Peculiarity of discharge properties of aluminium anode —**

Y. Yokota (J. Electrochem. Soc., Japan, **29,** E 128, 1961).

3. **Fuel cells: Tomorrow's power plant—**

W. T. Reid and A. P. Edson (Battelle Tech. Review, **11,** No. 6, 2, 1962). Discussion of the most promising types, their present status and potentialities. Low and high temperature cells; efficiency and fuels; future outlook.

4. **A. C. Corrosion: Test show A. C. increases corrosion of metals underground—**

F. O. Waters (Materials Protection, **1,** No. 3, 26, 1962). Laboratory investigations indicated that A.C. will accelerate the corrosion of steel or copper. In the field tests it was difficult to obtain data to show quantities of current flow. One figure, 3 tables and 11 references.

5. **Anodic dissolution of metals. Potential-current studies on silver and copper—**

P. B. Mathur, N. Karuppannan and P. N. Anantharaman (Plating, **49,** 376, 1962). Potentiometric studies on the anodic dissolution of silver and copper in various electrolytes have been made to establish the criteria for the current efficiency of the electrode process.

6. **Corrosion prevention in strorage and packaging of automobile components—**

K.J. Bigwood (Australasian Corrosion Engg., **6,** No. 4, 9, 1962). Factors influencing preservation, approval of corrosion prevention compounds, preservation schedule, conclusion.

7. **Corrosion problems in storage and packaging in the electronics industry—**

A. J. W. Beck (Australian Corrosion Engg., **6,** No. 4, 15, 1962). Introduction, procedure, types of goods, materials used, finishing, waterproof packing, waterproof and vapour-proof packing, desiccants, internal protection materials, protection of packaging material, labelling and presentation, testing methods.

8. **Corrosion of cathode in commercial electrolysis of water—**

K. S. G. Doss, S. Visvanathan and Indra Sanghi (J. Electrochem. Soc., Japan, **29,** E71, 1961). It has been observed that certain regions of the backside of the end cathodes made of mild steel in the commercial oxygen hydrogen cells are getting corroded. A preliminary attempt has been made to investigate the causes of the corrosion and to find out ways of eliminating it.

9. **Study of corrosion inhibitors by impedance measurement I.—**

T. Murakawa, S. Nagaura and K. Ohashi (J. Electrochem. Soc., Japan, **29,** E97, 1961). Measurements have been made of alternating current impedance of metal surface in electrolytic solution to investigate the adsorption mechanism of corrosion inhibitors on metals. This has been applied to smooth platinum or steel in sulphuric acid, with thiourea. It is concluded that the effectiveness of inhibitors can be evaluated by polarization capacity and polarization resistance. Nine figures and 5 references.

10. **Predicting behaviour of corrosion resistant alloys by potentiostatic polarization methods—**

N. D. Greene (Corrosion, **18,** 136t, 1962). Electrochemical methods for pedicting behaviour of corrosion-resistant alloys are reviewed and analyzed on the basis of modern electrode kinetic theory. The noble metal alloy concept and other methods to increase the corrosion resistance of active-passive metals are considered in detail. The problems associated with the measurement and interpretation of potentiostatic, anodic polarization curves are also discussed. A para-

meter, passivity index, is defined and utilized to predict corrosion behaviour under different environmental conditions. Nine figures and 30 references.

11. **Chemical engineering and corrosion science—**

T. K. Ross (Trans. Inst. Chem. Engineers, **40**, 83, 1962). The relationship between chemical engineering and corrosion science is examined. The principles of the latter are outlined, and their application to chemical engineering illustrated by examples of corrosion in chemical plant. Twenty-seven references.

12. **Corrosion of duraluminium in acid and alkaline solutions—**

I. A. Ammar and A. F. Nazmi (Corrosion Prevention and Control, **9**, No. 5, 31, 1962). Corrosion of duraluminium in hydrochloric acid and sodium hydroxide solutions has been studied using various techniques for the determination of weight loss. The effect of some inorganic inhibitors was also studied. Four tables, 5 figures and 11 references.

13. **Atmospheric corrosion of metals: Part IV — Corrosion of metals in Cochin—**

B. Sanyal, A. Balakrishnan, G. K. Singhania and U. G. K. Menon (J. Sci. and Ind. Res., **21D**, 185, 1962). The rates of corrosion of mild steel and zinc have been determined under outdoor and indoor conditions of exposure at Cochin, representing a marine atmosphere. The corrosion of metals is highest during the rainy season and is related to the salinity in the atmosphere.

14. **Some corrosion problems in the design of contact sulphuric acid plants—**

R. K. Gupta, S. K. Chaudhuri and J. P. Kapur (J. Sci. and Eng. Research, **6**, pt1, 139, 1962). Some of the major corrosion problems normally faced in contact sulphuric acid plants have been discussed in relation to the experience gained at the D.C.M. Chemical works, Delhi.

15. **The future of cathodic protection—**

Wilbow (Corrosion Engineer, **4**, No. 6, i, 1962). Historical, present position, new anode materials, marine cathodic protection, the future.

16. **Copper corrosion I. Thermodynamic aspects, II. Kinetic studies, III. Electrochemical theory of general corrosion, IV. The effects of saline additions—**

D. J. G. Ives and A. E. Rewson (J. Electrochem. Soc., **109**, 447, 452, 458, 462, 1962).

17. **Corrosion problems associated with the use of stainless steel in the building industry—**

H. R. Dalziel (Australasian Corrosion Engineering, **6**, No. 5, 11, 1962). Types of stainless steel used in architecture, effect of environment, design and fabrication, installation, conclusions.

18. **The significance of electrochemical polarization in corrosion studies—**

J. Sundararajan and T. L. Rama Char, (Australasian Corrosion Engineering **6**, No: 6, 9, 1962). The utility and importanee of cathodic and anodic polarization measurements in corrosion work has been outlined. Polarization data have been discussed with special reference to: principles and techniques, corrosion and its inhibition, mechanism of corrosion inhibition, cathodic protection, passivity and anodic protection, and applications. Four figures and 83 references.

19. **Corrosion inhibition of aluminium-zinc alloy in hydrochloric acid solutions—**

K. G. Sheth and T. L. Rama Char (Corrosion, **18**, 218t, 1962). Corrosion rates and inhibitor efficiencies in hydrochloric acid solutions have been determined for aluminium-zinc alloy containing 4.5-6.5 per cent zinc. The efficiencies are in the range: acridine 80-98, thiourea 86-95, nicotinic acid 80-97, strychnine 64-94 and quinine hydrochloride 58-95 per cent. Polarization studies with thiourea, strychine and quinine hydrochloride show that anode polarization is negligible, whereas cathode polarization is considerable. The Tafel plot is valid in this case. Dissolution of the metal is electrochemical in character. With these inhibitors the corrosion process appears to be essentially under cathodic control. One table, 13 figures and 27 references.

20. **Electrochemical techniques for measurement and interpretation of corrosion—**

E. H. Phelps (Corrosion, **18**, 239t, 1962). Potential measurements, potential distribution in the solution, rotating-electrode method of detecting corrosion currents, local-cell polarization diagrams, use of cathodic and anodic polarization curves to measure rate of corrosion. Thirteen figures and 22 references.

21. **Corrosion inhibiting properties of some nitrosophenols with mild steel—**

S. M. Peach and L. Haller (Corrosion Technology, **9**, 177, 1962). This is a new approach, by way of complex coordination compounds, in the field of corrosion inhibition. It is shown that phenols containing strongly polar groups actually accelerate corrosion and those without inhibit corrosion.

22. Cathodic protection – an economic survey—

(Corrosion Prevention and Control, **9**, No. 7, 43, 1962). A discussion of the economic balance between protection by impressed current and with a coating. Three figures on cost-coating efficiency, current-coating efficiency, and overall cost in the combined method.

23. Atmospheric corrosion by electrolyte nuclei—

B. Sanyal and D. V. Bhadwar (J. Sci. and Ind. Res., **21D**, 243, 1962). The atmospheric corrosion of common engineering metals by nuclei of selected electrolytes has been investigated under controlled conditions. A new technique has been developed for inoculating the metal surfaces with the electrolyte nuclei. The effect of variables like humidity, temperature, exposure period and pH has also been followed.

24. Bright finishing superpurity aluminium. Part 1-Electropolishing. Part 2-Anodizing—

B. A. Shenoi, K. S. Indira and K. Vijayalakshmi (Metal Finishing, **60**, No. 4, 44; No. 5, 49, 1962). Selection of the metal for reflectors, chemical polishing, electropolishing, measurement of reflectivity, six figures and 11 references; electropolishing, anodizing processes, 6 references.

25. The cleaning of metals. Part 1 – Alkaline cleaning—

L. F. Spencer (Metal Finishing, **60**, No. 4, 59, 1962). Soil type and selected factors, cleaning mechanisms, alkaline cleaner formulation, alkaline cleaning methods, conclusion. One figure, 4 tables and 4 references.

26. Science for electroplaters 71. Levelling agents – nickel. 72. Watts bath analysis. 73. Nickel sulphamate and fluoborate—

L. Serota (Metal Finishing, **60**, No. 4, 73; No. 5, 68; No. 6, 81; No. 7, 59, 1962). Current-density, agitation, electro-reduction, adsorption, levelling measurements; nickel analysis, chloride determination; boric acid; sulphamic acid, sulphamate-choloride.

27. Preparation of and electroplating on uranium—

D. E. Couch (Plating, **49**, 363, 1962). The black film that forms between uranium and coatings electrodeposited on it results from the solutions used in aqueous cleaning and plating procedures. It was eliminated by using a completely anhydrous plating solution. A porosity test, using hydrogen, was developed for testing the porosity of plated coatings on uranium.

28. Bismuth electroplating—

J. G. Beach (Plating, **49**, 368, 1962). Electrodeposition of alternate layers of nickel and bismuth onto aluminium and subsequent heating to diffuse the bismuth-nickel layers produced the direct bismuth-nickel alloy coatings. Using periodic reverse current plating, satisfactory bismuth electrodeposits were obtained from an acid chloride bath without addition agents.

29. Plating die castings—

(Zinc Abstracts, **20**, No. 2, 1962; abstract 1544). Patent number 880, 786 describes a method for electrodepositing nickel directly on to zinc alloy die castings from alkaline nickel citrate solutions. Bright deposits are produced by adding nickel formate, formaldehyde and saccharin to the plating solution, or by subjecting the original deposits to a further nickel plating under acid conditions.

30. The crystal orientation of electrodeposited metals—

N. A. Pangarov (Electrochmica Acta **7**, 139, 1962). Calculations have been made for the work of formation of the two dimensional nucleus of the metals crystallizing in f.c.c. and b.c.c. lattices. It is shown that the crystal orientation of thick deposists depends upon this work. The overvoltage during deposition also affects the orientation.

31. Testing of nickel and chromium electrodeposits—

P. S. Clark (Met. Industry, **100**, 262, 294, 1962). Survey under nickel-chromium systems, ductility, stretching methods, hardness, stress; levelling power, thickness-porosity-corrosion.

32. Electrodeposition of copper from the sulphamate bath—

S. Venkatachalam (J. Sci. and Ind. Res., **21D,** 145, 1962). Plating of copper from sulphamate solutions has been investigated. The optimum conditions for obtaining satisfactory deposits on copper are: bath composition—copper 63.5, sulphamate 197 g/l; pH 2, 25°C, still plating; and limiting current density 7 amp/dm². The anode and cathode efficiencies are close to 100 per cent. The sulphamate bath is comparable to the sulphate and fluorobate baths for the electrodeposition of copper except for its somewhat poorer throwing power. Two tables, 9 figures and 22 references.

33. **pH control in electrodeposition and the value of instrumentation—**

D. Jones and O. P. Rimmer (Electroplating and Metal Finishing, **15,** 150, 1962). Introduction, buffering action, importance of pH in electrodeposition, pH measurement.

34. **Design for electroplating—**

D. N. Layton (Electroplating and Metal Finishing, **15,** 159, 1962). Effect of design, how the designer can help, how the plater can help.

35. **Mechanism of the electrodeposition of alloys of chromium with other metals—**

D. N. Usachev and N. A. Pavlova (Russian Journal of Physical Chemistry, **35,** 1053, 1961). The ability of various anions to penetrate the cathodic film formed during the electrodeposition of chromium from chromic acid solution is determined by the negative charge on the anions and is independent of their nature.

36. **Effect of inhibition on the electrodeposition of metals—**

A. T. Vagramyan and L. A. Uvarov (Trans. Inst. Metal Finishing, **39,** part 2, 54, 1962). Some features of the electrodeposition of metals, like silver and nickel, caused by cathodic inhibition under actual conditions of electrolysis have been considered. Polarization data have been included.

37. **Radioactive study of addition agent behaviour: 1, Incorporation of sulphur and carbon in nickel deposited from solutions containing thiourea: 2, Adsorption of metal surfaces from solutions containing thiourea; 3, Incorporation of sulphur in nickel deposited from solutions containing p-toluene sulphonamide and saccharin—**

J. Edwards (Trans. Inst. Metal Finishing, **39,** part 2, 33, 1962).

38. **Structure of electrolytic silver-copper alloys—**

P. L. Ahuja and T. Banerjee (NML Tech. J., **4,** No. 2, 15, 1962). The existence of metastable phases in silver-copper alloys electrodeposited from the cyanide bath has been observed by x-ray powder diffraction technique, and their subsequent transformation explained.

39. **Iron-cobalt alloy deposition from the pyrophosphate bath—**

D. V. Subrahmanyam and T. L. Rama Char (Chemistry and Industry, 930, 1962). Investigations have shown that the pyrophosphate bath is suitable for the plating of iron-cobalt alloys containing 15–80 per cent iron. The cathode efficiency is rather low, and the limiting current density 6 amp/dm². Table gives effect of variables on deposit composition, cathode efficiency and potential.

40. **Electrodeposition of cadmium and zinc from the sulphamate bath—**

S. Venkatachalam and T. L. Rama Char (Metalloberfläche, **16,** 166, 1962). The optimum conditions have been established for the electrodeposition of cadmium and zinc from sulphamate solutions. The electrode efficiencies are close to 100 per cent, and the limiting current density is 12 amp/dm² for cadmium and 14 amp/dm² for zinc. The electrode potentials have been measured without and with addition agents, and the throwing power of the plating solutions determined with a modified Haring-Blum cell. The sulphamate bath is comparable to the fluoborate and sulphate baths for cadmium and zinc plating respectively. Four tables, 9 figures and 26 references.

41. **Electroplating for aircraft applications—**

(Metal Industry, **100,** 369, 389, 1962). Procedures for plating high nickel alloys and stainless steel.

42. **Ultrasonic cleaning — 1, 2 —**

H. J. Gollmick (Metal Finishing J, **8,** 161, 201, 1962). Physical basis, cleaning action of ultrasonics, effect of ultrasonic frequencies on cleaning, ultrasonic transducers; high frequency generators, cleaning vessel and media, examples from production, suitability and economics.

43. **Production of hard anodic coatings on aluminium—**

A. Jogarao, B. Sambamurthy and R. Vedaraman (J. Sci. and Eng. Research, **6,** pt 1, 145,

1962). Very hard anodic coatings on aluminium have been produced with the oxalic acid electrolyte. Application have been indicated, and design features for pilot plant operation considered.

44. **Electroless plating today—**

E. B. Saubestre (Metal Finishing, **60,** No. 6, 67; No. 7, 49, 1962). Principles, preplating treatment for metals, non-metallics and semiconductors; plating of arsenic, cadmium, chromium, cobalt and copper.

45. **The effects of addition agents on physical and mechanical properties of electrodeposits—**

H. J. Read (Plating, **49,** 602, 1962). A review with data on the mechanical and physical properties of deposits of nickel and copper from different baths.

46. **Hydrogen embrittlement of high tensile steels during chemical and electrochemical processing. Part 5. Chromium, silver, nickel, tin and electroless nickel plating—**

L. E. Probert and J. J. Rollinson (Electroplating and Metal Finishing, **15,** 228, 1962). It is shown that hydrogen absorbed during processing is not a problem if treated correctly. The conditions of embrittlement are directly associated with differential pressures at the surface of high tensile steels.

47. **Nickel-cobalt alloy plating from the sulphamate bath—**

S. Venkatachalam and T. L. Rama Char (Electroplating and Metal Finishing, **15,** 233, 1962). Nickel has been codeposited with cobalt from the sulphamate bath. Detailed studies on alloy composition, cathode efficiency and electrode potentials have led to a determination of the operating condititions for obtaining satisfactory deposits containing 9 to 69 per cent nickel. In the high current density range the composition of the deposit was practically constant. The efficiency of cast alloy anodes was satisfactory. X-ray patterns of the deposits show the existence of the f.c.c. and h.c.p. structures. Four tables, 12 12 figures and 32 references.

48. **Mechanism of the electrolytic polishing of metals and the structure of the polished surface from electron-microscope data—**

G. S. Vozdvizhenskii, G. A. Gorbachuk and G. P. Dezider'ev (Russian J. Phy. Chem., No. 10, 1077, 1961). Anode potential and photomicrographic data for copper and brass.

49. **Aluminium and its alloys in 1961. Some aspects of research and technical progress reported—**

E. Elliott (Metallurgia, **65,** 112, 1962). Welding, constitution, properties, corrosion and protection, applications, standards; 198 references.

50. **Electrochemical machining of refractory alloys—**

W. B. Stephenson (Products Finishing, **26,** No. 8, 36, 1962). A faster way to cut and shape the super alloys now being used for space age products. Hardness tests, solution, equipment, temperature control.

51. **Use of aluminium in the chemical process industry—**

R. S. Dalrymple (Materials Protection, **1,** No. 5, 37, 1962). Brief historical survey, applications, economics.

52. **Production of high purity chromium from an aqueous fluoride bath—**

E. A. Brandes and J.A. Whittaker (Metallurgia, **65,** 209, 1962). A pilot plant produces 4 kg of chromium per week from a fluoride type bath with 38 per cent cathode efficiency.

53. **Electrolytic recovery of chlorine from hydrochloric acid—**

D. W. Schroeder (I and EC, Process Design and Development, **1,** 141, 1962). The proposed process involves electrolysis of nickel chloride and dissolution of nickel in hydrochloric acid. It permits the recovery of chlorine and hydrogen from anhydrous or aqueous hydrochloric acid in a comparatively simple plant. The consumption of electricity is 1350 kw-hr per ton of chlorine. Other utility demands are low. Flow diagram, 3 tables and 9 references.

54. **Commercial electrolytic cell for periodic acid production—**

C. L. Mantell (I and EC, Process Design and Development, **1,** 144, 1962). The design of cells, for production of dialdehyde starch, is given in detail with bills of material, for reproduction, along with operating results.

55. **Studies on the preparation of fluorine and its compounds I. Manufacturing equipments of anhydrous hydrofluoric acid and 100 amp. fluorine cell—**

N. Watanabe, B. Tybun and S. Yoshizawa (J. Electrochem. Soc., Japan, **29,** E110, 1961). Liquid anhydrous fluoric acid generator and

equipment, fluorine cell, experimental results, **II. Some influences on the anodic polarization in the electrolytic generation of fluorine**—N. Watanabe et al (ibid, **29,** E177, 1961). **III. Relations between the wettability of anode and the anodic polarization in the electrolytic generation of fluorine**—N. Watanabe et al (ibid, **29,** E180, 1961). **IV. Anodic overvoltage in fluorine generation**—N. Wattanable et al (ibid, **29,** E242, 1961).

56. **Preparation of lead dioxide electrodes II.**—

K. C. Narasimhan, S. Sundararajan and H. V. K. Udupa (J. Electrochem. Soc., Japan, **29,** E137, 1961). Deposition of lead dioxide on carbon substrate from lead nitrate bath is described as a suitable method of obtaining desired size anodes for electrolytic oxidations.

57. **Water desalting plant to prove out electrodialysis**—

N. P. Chopey (Chem. Engg., **69,** No. 11, 104, 1962). Department of Interior, U.S.A., starts its large scale tryout of process that uses no phase changes in winning fresh from salt water. Process, flowsheet, performance.

58. **Analytical applications of the mercury electrode**—

J. A. Page, J. A. Maxwell and R. P. Graham (The Analyst, **87,** 245–273, 1962). Review: reduction without external control of electrode potential, reductions and oxidations with external control of electrode potential, coulometric determinations at controlled current, amalgamometry; 423 references.

59. **Researches on the electrolysis of brine water using mercury jet cathode. III. Electrolytic current on mercury jet cathode. IV. Current potential curve on mercury jet cathode**—

S. Toshima (J. Electrochem. Soc., Japan, **29,** E121, 124, 1961).

— T. L. R.