ABSTRACTS

1. **Development in magnesium batteries–**

P. B. Mathur and N. J. Paul (J. Sci. and Ind. Res., **19A,** 597, 1960). Introduction, magnesium batteries and difficulties in the development, commercial cells, short duration-reserve or liquid-activated batteries, thermal batteries, low temperature cells ; 36 references.

2. **Fuel cells—**

R. G. H. Watson (Ind. Chemist, **37,** No. 431, 3, 1961). A review of the present state of development of the fuel cell. Methods of improving cell performance, based on an analysis of energy losses are outlined. 22 references.

3. **Corrosion problems and their treatment, 2, 3, 4—**

(The Corrosion Engineer, **2,** No. 10, iv ; No. 11, i ; No. 12, iii, 1960). 2. Water storage tanks-reasons for corrosion, anti-corrosion techniques for rectangular, cylindrical and spherical tanks. Table showing various structures and materials attacked by corrosion and the relative merits of anti-corrosion techniques. 3. Introduction, anti-corrosion techniques, environment, steel pipeline, cast iron or spun iron and non-metallic pipes, techniques in practice, cathodic protection, insulating, painting. 4. Steel structures in the atmosphere, anti-corrosion methods and practice.

4. **Cathodic protection of water treatment plants—**

F. O. Waters (Corrosion, **16,** 487t, 1960). Corrosion processes confronting water treatment plants are enumerated. Problems encountered in the installation, testing and operation of cathodic protection for rapid sand and pressure type filters are discussed. A six year operating experience indicates the value of cathodic protection in both types of treatment plants.

5. **Zinc as a self-regulating galvanic anode for ship hulls—**

J. A. H. Carson (Corrosion, **16,** 491t, 1960). Advantages of zinc anode systems, recent developments on the effect of composition on anode performance, results of service trials for high purity and alloyed zinc hull anodes, discussion, recommendations. Four tables, 13 figures and 16 references.

6. **Corrosion of metals in tropical environments—**

C. R. Southwell, B. W. Forgeson, and A. L. Alexander (Corrosion, **16,** 512t, 1960). This article is the fourth in the series and deals with wrought iron.

7. **Corrosion of copper and its alloys in sea bittern—**

A. N. Kappanna and A. Visveswara Rao (Indian J. Appl. Chem., **23,** 117, 1960). Under steady conditions copper has been found to withstand corrosion better than its alloys in sea bittern of 32° Be. Admiralty brass and phosphor bronze offer better resistance to attack than copper under aeration. The presence of sulphate ion has been shown to exert a retarding influence on the corrosion of copper and its alloys.

8. **Corrosion inhibition of aluminium : Cathodic protection by impressed current—**

J. Sundararajan and T. L. Rama Char (Corrosion Prevention and Control, **7,** No. 11, 49, 1960). Polarization studies have been made during the corrosion of commercial and pure aluminium in acid and alkaline solutions in the presence of inhibitors. The possibilities of cathodic protection of aluminium under these conditions are discussed.

9. **Now: anodic corrosion control—**

C. E. Locke et al (Chem. Eng. Progress, **56,** No. 11, 1960). Anodic protection of process vessels against oleum and sulphuric acid improves product quality, decreases processing time and maintenance costs, extends tank life. Fourteen figures including polarization curves and 6 tables.

10. **Instrumentation for the assessment of corrosion—**

C. E. Perry (Australian Corrosion Engineering, **4,** No. 8, 5, 1960). Brief survey of the different types of non-destructive wall thickness measuring instruments and methods of operation, together with the service limitations and applications.

11. **Design for corrosion prevention in the chemical industry—**

W. L. Whitton (Australian Corrosion Engine-

ering, **4**, No. 9, 35, 1960). Introduction, corrosion and design cost, corrosion and basic elements of design.

12. **Engineering design for corrosion prevention—**

M. R. Fordham (Australian Corroson Engineering, **4**, No. 10, 5, 1960). Introduction, telecommunication equipment, dissimilar metals in contact, welding, metals in concrete, material selection; bibliography.

13. **Anodic or cathodic? A problem in Corrosion Engineering—**

P. de Waele (The Corrosion Engineer, **2**, No. 12, i, 1960).

14. **New theory for rusting of iron. Role of hydrogen ions in promotion—**

(Metallurgia, **62**, 269, 1960). The new theory for the basic cause of iron corrosion proposed by Gulbransen and Copan suggests for the first time that the true cause is hydrogen ions or protons. The hydrogen ions come from water vapour which must be present if iron is to rust to any great extent at room temperature. It is suggested that the tiny hydrogen particles penetrate the iron and enlarge the sites at which oxygen normally combines with the metal. This spreads the reaction throughout the surface of the iron causing it to rust destructively.

15. **Cathodic protection of galvanized steel in quiet sea water—**

(Bull of the Sea Horse Inst, **3**, No. 1, 6, 1960). Tests indicate need for precise potential control to achieve optimum benefits. One table and three figures giving data on potentials and corrosion rates.

16. **Impressed current anodes for cathodic protection—**

W. P. Noser (Corrosion, **16**, 587t, 1960). Development and use of impressed current anodes for cathodic protection of underground structures is traced from early beginning to present time. Recommendations are made for installing anodes for various soil conditions. Use of lead alloy and platinum anodes for underwater use is mentioned.

17. **Inhibition of aluminium-zinc alloy corrosion in sodium hydroxide—**

J. Sundararajan and T. L. Rama Char (Corrosion Prevention and Control, **7**, No. 12, 38, 1960). The inhibitor efficiencies during the corrosion of aircraft aluminium-zinc alloy in sodium hydroxide have been determined with gum acaciae, agar agar, gelatin, dextrin and glue. Polarization studies have been made with dextrin. Three figures on weight loss, inhibitor efficiency and electrode potentials.

18. **Conditions for the cathodic protection of metals—**

M. Pourbaix (Corrosion Prevention and Control, **7**, No. 12, 43, 1960). Introduction, thermodynamic and kinetic conditions of cathodic protection, conclusions.

19. **Atmospheric corrosion of metals: Part III—Corrosion of Metals in Calcutta—**

B. Sanyal et al (J. Sci. and Ind. Res., **0D**, 27, 1961) The rates of corrosion of mild steel and zinc and the extent of atmospheric pollution have been determined under outdoor and indoor conditions of exposures at Calcutta, representing an industrial atmosphere. Three tables and three figures.

20. **Criteria for cathodic protection—**

K. S. Rajagopalan (J. Sci. and Ind. Res., **20A**, 27, 1961). Introduction, the Evans diagram, reversible anode potential, break method, electrode kinetics, criterion for cathodic protection in acid and neutral solution, the Hull cell technique, role of anodic polarization, 24 references.

21. **Fabrication: Key to mixer corrosion—**

N. H. Parker (Chem. Engg, **67**, No. 26, 112, 1960). Fabricating techniques—cast, welded or bolted, blade angle, shaft bearings and shaft sealing devices, all play a vital role in minimizing mixer corrosion. The eleventh and concluding part of a series on corrosion-control designs published in 1960.

22. **Aluminium and corrosion. A review of progress in 1961—**

F. C. Porter (Corrosion Prevention and Control, **8**, No. 1, 37, 1961). Basic research, atmospheric and aqueous corrosion, acid and alkali attack, contact with other materials, cathodic protection; finishes; 168 references.

23. **Quinine hydrochloride as inhibitor for aluminium-copper alloy in hydrochloric acid—**

K. G. Sheth and T. L. Rama Char (Corrosion Prevention and Control, **8**, No. 1, 47, 1961). Quinine hydrochloride has been found to be a satisfactory inhibitor for the corrosion of aircraft aluminium-copper alloy in hydrochloric acid solutions. Two tables giving inhibitor efficiency, anode weight loss and cathode polarization.

24. **Corrosion problems and their treatment 5—**

(The corrosion Engineer, **3,** No. 1, ii, 1961). Heat exchangers and water coolers, engineering considerations, causes of corrosion, anti-corrosion techniques, application problems.

25. **The protection of structural steel against corrosion—**

J. C. Hudson (Chemistry and Industry, No. 1, 3, 1961). Introduction, general remarks—paints, metal and other coatings, protection against air, soil and water; bibliography.

26. **Relative corrodibility of zinc and steel in unpolluted atmospheres—**

K. S. Rajagopalan and G. Ramaseshan (J. Appl. Chem., **10,** 493, 1960). The atmospheric conditions under which zinc corrodes faster than steel have now been investigated with reference to well-defined temperature and humidity conditions and in relation to the period of exposure.

27. **Principles and applications of cathodic protection—**

K. A. Spencer (Chemistry and Industry, No. 3, 62, 1961). Introduction; causes of corrosion; cathodic protection—principles, practical application, advantages and disadvantages, practical considerations, design of structures, effect on adjacent structures, economics.

28. **Molybdates inhibit corrosion—**

(Battelle Tech. Review, **10,** No. 1, 20, 1961). In addition to corrosion inhibiting properties, calcium and zinc molybdates have the virtues of being nontoxic and white, which makes them advantageous in some applications.

29. **Corrosion studies of aluminium in chemical process operations—**

E. H. Cook et al (Corrosion, **17,** 25t, 1961).

30. **Inhibition of corrosion of commercial aluminium in alkaline solutions—**

J. Sundararajan and T. L. Rama Char (Corrosion, **17,** 39t, 1961). The corrosion rates and inhibitor efficiencies have been determined for commercial aluminium containing 4 per cent manganese and 3 per cent iron in sodium hydroxide solutions. The efficiency decreases in the order: agar-agar, gum acaciae, dextrin, gelatin, glue. Corrosion potential and polarization measurements have been made without and with dextrin. A mechanism of inhibitor action has been suggested. Nineteen figures and 27 references.

31. **Semiconductors—their production and properties—**

W. H. Dennis (Metallurgia, **62,** 261, 1960). Features of semi-conductors; recovery and processing—germanium, silicon, selenium.

32. **Electroluminescence—**

M. R. Seiler and C. S. Peet (Battelle Tech. Review **9,** No. 12, 8, 1960). Discussion of the basic principles, materials and uses associated with the phenomenon of electroluminescence.

33. **Zinc coatings on iron and steel. 7-Tests and specifications—**

A. K. Parker (Metal Finishing J, **6,** 393, 1960). Concluding part: visual inspection, tests for coating thickness, uniformity, adhesion and ductility; 19 references.

34. **Stress in electrodeposited metals—**

I. L. Newell (Metal Finishing, **58,** No. 10, 56, 1960). Measurement, effect on properties and uses of electrodeposits, theory; stress in electrodeposited metals—copper, zinc, lead, cadmium, chromium, nickel.

35. **Barrel plating solutions—**

F. J. La Manna (Metal Finishing, **58,** No. 10, 66, 1960). Concluding part: brass, bronze, cadmium, chromium, copper, gold, iron, lead, nickel, rhodium, silver, tin, zinc.

36. **Science for electroplaters. 60, Causes of poor adhesion. 61, 62. adhesion tests—**

L. Serota (Metal Finishing, **58,** No. 10, 72; No. 11, 65; No. 12, 65, 1960; **59,** No. 1, 49, 1961).

37. **Chemicals for the electroplating industry in India—**

S. Krishnamurthy (Chemical Age of India, **11,** 601, 1960). Introduction, plating chemicals, primary chemicals versus made-up plating chemicals, quality of chemicals, future of the industry. Four tables giving production figures and analysis for some chemicals.

38. **Plating anodes—**

D. J. Fishlock (Electroplating, India, **2,** No. 3, 7, 1960). Introduction, alloy anodes, copper and nickel anodes, anode slimes; specifications and analysis; 13 references.

39. **Anodising and colouring of aluminium—**

K. C. Srivastava (Electroplating, India, **2,** No. 3, 22, 1960). This article describes the theory

and practice of bright polishing, anodising, colouring, sealing of the aluminium surface, together with details of the equipment required.

40. **Electroformed copper waveguides—**

L. E. Hall and B. H. Meggs (Metal Industry, **97,** 435, 1960). Introduction, fabrication, milled block, electroforming, protective treatments.

41. **Electrodeposition of cobalt-tungsten alloys from the pyrophosphate bath—**

K. I. Vasu and T. L. Rama Char (J. Sci. and Ind. Res., **19B,** 510, 1960). The pyrophosphate bath has been successfully used for the codeposition of cobalt with tungsten, and optimum conditions have been established for obtaining satisfactory cobalt-tungsten alloy plates containing 10 to 49 per cent tungsten. Table gives effect of different variables on deposit composition, cathode efficiency and cathode potential.

42. **Cobalt plating from the sulphamate bath—**

S. Venkatachalam and T. L. Rama Char (J. Sci. and Ind. Res., **19B,** 512, 1960). Detailed studies have established the conditions for obtaining satisfactory electrodeposits of cobalt from the sulphamate bath up to a current density of 14 amp/dm^2. Table gives effect of different variables on cathode efficiency and polarization.

43. **Control of chromium plating baths—**

J. P. Branciaroli (Products Finishing, **25,** No. 3, 50, 1960). Improved chromium plating possible through the use of simplified analytical control methods.

44. **Chemical conversion coatings —**

F. C. Porter (Ind. Finishing, **12,** No. 150, 23, 1960). A survey of processes suitable for aluminium, with an account of their characteristics and applications ; 3 tables and bibliography.

45. **Electrodeposition of nickel-cobalt alloys—**

A. J. Steiger (Metal Finishing, **58,** No. 12, 53, 1960).

46. **The value of specifications in electroplating—**

(Wiggin Nickel Alloys, No. 59, 19).

47. **Metal finishing technology, A student's guide : 5, 6—**

A. Alexander (Met. Finishing J. **6,** 437, 1960 ; **7,** 19, 1961). Alternating current and applied electrochemistry.

Electrodeposition of tin from the stannous pyrophosphate bath—

(Miss) Vasanta Sree (J. Sci, and Ind. Res., **20D,** 18, 1961). The electrodeposition of tin from the pyrophosphate bath has been studied using potassium pyrophosphate in place of sodium pyrophosphate to form a complex. This bath possesses some advantages over the commercial stannate bath in respect of cathode efficiency, speed of plating, bath voltage, resistivity, throwing power and anode control. Two tables and six figures ; 11 references.

49. **Iron plating from the sulphamate bath—**

S. S. Misra and T. L. Rama Char (J. Sci. and Ind. Res., **20D,** 43, 1961). The sulphamate bath has been used for the deposition of iron and the conditions established for obtaining satisfactory plates up to a current density of 12 amp/sq. dm. Table gives effect of variables on cathode efficiency and polarization.

50. **Measurement of the thickness of electroplates by the electrolytic stripping method : nickel over copper base —**

P.B. Mathur and A.S. Lakshmanan (J. Sci. and Ind. Res., **20D,** 16, 1961). A stripping cell of improved design and a stripping solution for the determination of thickness of nickel electrodeposits over copper by the anodic stripping method are reported.

51. **Electrodeposition of nickel - cobalt alloys from the pyrophosphate bath —**

(Miss) Vasanta Sree and T. L. Rama Char (J. Electrochem. Soc., **108,** 64, 1961). Nickel has been codeposited with cobalt from the pyrophosphate bath. Detailed studies on alloy composition, cathode efficiency and potential have led to the optimum conditions for obtaining satisfactory alloy plates with 10-91 per cent nickel. The efficiency of cast alloy anodes is quite high. X-ray patterns of the deposits show the existence of f.c.c. and hexagonal structures. The deposit composition could be altered appreciably only by varying the metal content of the bath. Four tables, 14 figures and 23 references.

52. **Electrodeposition of cobalt - molydenum alloys —**

A. Krohn and T. M. Brown (J. Electrochem. Soc., **108,** 60, 1961). This investigation has shown that the pyrophosphate bath can be used to deposit cobalt - molybdenum alloys. The average content of the deposits was molybdenum 56, cobalt 37 and nonmetallic material 7 per cent, and the cathode efficiency 46 per cent.

The deposits were bright and adherent but tarnished readily unless a protective coating was applied.

53. **Effect of ultrasonics on electrolytic deposition of copper from a cyanide bath —**

C. B. Kenahan and D. Schlain (Plating, Internat. Issue, **48**, No. 1, 37, 1961). The application of ultrasonics in the electrolytic deposition of copper from a simple, low-temperature cyanide bath resulted in large increases in anode efficiencies, accompanied by large decreases in cell voltage. Electrode potential studies indicated that the decrease in cell voltage resulted chiefly from depolarization at the anode.

54. **Electrodeposition of iron-zinc alloys from the pyrophosphate bath —**

(Miss) Vasanta Sree and T. L. Rama Char (Plating, Internat. Issue, **48**, No. 1, 50, 1961). Iron has been co-deposited with zinc from the pyrophosphate bath. A detailed study has been made of the effect of the variables on alloy composition, cathode efficiency and cathode potential. The optimum conditions have been established for obtaining satisfactory plates containing 10 to 100 percent iron. There were sudden changes in deposit composition and cathode potential at low current densities due to the deposition of alloys of different phases as shown by x-ray studies: alpha, alph plus epsilon, and zeta phases. In the high current density range the composition of the alloy was practically constant. Three tables, 11 figures and 21 references.

55. **Rhodium plating to specification —**

R. R. Benham (Platinum Metals Review, **5**, No. 1, 13, 1961). This article reviews the specification and outlines recommended procedures for the successful preparation of rhodium electrodeposits.

56. **Effect of addition agents in copper plating from the sulphamate bath—**

S. Venkatachalam and T. L. Rama Char (Electroplating and Metal Finishing **14**, 3, 1961). The sulphamate bath has been found to be satisfactory for the plating of copper. The effect of several addition agents on bath performance, polarization and nature of the deposit has been studied. Gelatin, glue, EDTA and sulpho-salicylic acid increase the cathode polarization and give bright deposits. One table, 2 figures and 16 references.

57. **Nickel plating. A review of recent developments—**

H.C. Castell (Electroplating and Metal Finishing, **14**, 6, 1961). Historical development of modern techniques, corrosion resistance, bright nickel, corrosion testing; 29 references.

58. **Electrocleaning: A report on current practice—**

(Products Finishing, **25**, No. 4, 50 1961). Panel discussion on the hows and whys of electrocleaning; tips on improving results.

59. **Electrodeposition of iron — tungsten alloys from the pyrophosphate bath—**

K.I. Vasu and T.L Rama Char (J. Sci. and Ind. Res., **20D**, 81, 1961). Iron has been codeposited with tungsten from the pyrophosphate bath, and optimum conditions have been established for obtaining satisfactory alloy plates with 17 to 56 per cent tungsten. Table gives effect of variables on deposit composition, cathode efficiency and cathode potential.

60. **The electrodeposition of nickel-molybdenum alloys from highly concentrated sodium molybdate solutions containing nickel sulphate and sodium citrate—**

H. Imanaga (J. Chem. Soc. of Japan, Ind. Chem. Sect, **63**, 1336, 1960). The maximum molybdenum content in the deposit was 28 per cent, and the cathode efficiency decreased remarkably when the molybdenum concentration in the solution exceedeed 0.25 M.

61. **Technical developments of 1960—**

N. Hall (Metal Finishing, **59**, No. 1, 36B, 1961). Review: cleaning, pickling, polishing, anodizing, treatments for deposit adhesion, metallic coatings, electroforming—metallizing—vapour coating, conversion films — corrosion preventives, testing and control, waste treatment, miscellaneous; 386 references.

62. **Acceptance requirements for nickel—chromium plating—**

W. G. L. Miller (Electroplating and Metal Finishing, **14**, 40, 1961). Introduction, plating specifications, testing to specifications, approval of new parts, acceptance of production deliveries, testing methods.

63. **High—purity electrolytic chromium—**

M.J. Ferrante et al (J. Metals, **12**, 861, 1960). A study of massive chromium electrodeposited from aqueous chromic acid electrolytes at elevated temperatures—the relative effect of the catalytic action of sulphate, fluoride and silicofluoride on mechanical properties was investigated with a subsequent determination of optimum compositions. Three tables, 7 figures and 22 references.

64. **Electrolytic vanadium and its properties—**

D.H. Baker and J.D. Ramsdell (J. Electrochem. Soc., **107**, 985, 1960). The fused salt electrorefining technique has been applied successfully to vanadium, the electrolyte being sodium chloride containing 3-6 per cent vanadium as dichloride. Current efficiency was about 91 per cent.

65. **Ferromanganese production with oxygen enrichment—**

J. M. Stapleton et al (J. Metals, **13**, No. 1. 45, 1961). Tests with oxygen enrichment of the blast of ferromanganese furnaces to 26.5 per cent have shown a production increase of 29 per cent and a reduction in the coke rate of 11 per cent. Indications are that at higher levels of oxygen enrichment additional improvements are possible.

66. **Disposal of waste from metal—treatment plants—**

(Met. Finishing, J, **7**, 24, 1961). Report of Congress on industrial effluent held in Milan.

67. **Which process best for producing hydrogen?—**

G. R. James (Chemical Eng, **67**, No. 25, 161, 1960). Better heat recoveries, higher pressures, higher purities mark newer process methods. An expert compares five ways to make today's in—the—news hydrogen.

68. **Metal rectifiers for electrolytic processes—**

J. G. Bartholomew (Met. Finishing J, **6**, 432, 1960). A review of past and present developments.

69. **Isotopes in research and industry—**

(Internat. Atomic Enegy Agency Bull, **3**, No. 1, 19, 1961). Introduction, growth of isotope research, in geophysics and metereology, study of metals, tracer methods, further industrial uses, applications in chemistry, steady expansion.

70. **Estimation of cystine in acid zinc and Watts nickel baths by the A. C. polarographic method—**

V. K. Venkatesan and S. Guruviah (J. Sci. and Ind. Res., **19B**, 496, 1960). The A. C. polarographic method has been employed for the rapid estimation of cystine, a brightener for zinc and nickel plating, in the absence of wetting agents. The advantages of this method over the D. C. polarographic method are indicated.

—T.L.R.