ABSTRACTS

(A) General

1. **New high-performance methanol fuel cell electrodes—**

D. B. Boies and A. Dravnieks (Electrochem. Tech., **2**, 351, 1964). Electrochemically active electrodes were prepared by flame-spraying nickel-aluminium alloys, leaching the porous layer and light-platinizing the remaining Raney-nickel structure. Methanol oxidized electrochemically at such electrodes in alkaline solution at current densities up to 400 ma/cm² and potentials below o.85 volt vs. S.C.E. Energy-to-weight ratio for these cells should be several times higher than for the conventional batteries.

2. **Fuel cell progress—**

H. Harvey (Chemistry and Industry, 367, 1965). Brief review with bibliography.

3. **Corrosion and the field engineer(1)—**

M. S. Haque (Corrosion Prevention and Control, **12**, No. 2, 15, 1965). Introduction, procedures, atmospheric corrosion prevention, external surface coating, internal surfaces, removal of protectives, vapour degreasing, alkaline cleaning. One chart and 4 tables.

4. **Effect of copper content of carbon steel on corrosion in sulphuric acid—**

E. Williams and M. E. Komp (Corrosion, **21**, 9, 1965). Steels containing 0.02 per cent copper had corrosion rates as much as 16 times greater than those containing 0.1 per cent copper. There was not much change by a further increase up to 0.16 per cent. Electrochemical measurements indicated that copper dissolved in steel, at least up to 0.16 per cent, decreases the exchange current of the cathodic reaction in sulphuric acid solutions, thereby decreasing the corrosion rate.

5. **Relation between anodic dissolution and resistance to pitting corrosion—**

N. D. Greene and G. Judd (Corrosion, **21**, 15, 1965). Electrochemical measurements have shown that the ratio of dissolution rates in the presence and absence of chloride ion is inversely related to pitting resistance. These concepts have been used to predict accurately the relative pitting tendencies of austenitic stainless steels, Hastelloy C and titanium. Six figures, one table and 22 references.

6. **Curing condenser tube corrosion at Kincardine power station—**

(The Engineer, **219**, 499, 1965). Two remedial measures adopted *are* discussed: replacement of some aluminium brass alloy tubes by tubes of cupro-nickel alloy; dosing of cooling water with ferrous sulphate.

7. **Studies on the anodic dissolution of aluminium 2S in chloride electrolytes—**

P. L. Joseph and B. A. Shenoi (J. Electrochem. Soc., Japan, **32**, 73, 1964). Preliminary studies on the corrosion and anodic dissolution of aluminium in various chloride solutions show that sodium chloride is a suitable electrolyte for aluminium galvanic cells. One figure, 8 tables and 7 references.

8. **Effect of small additions of copper on the atmospheric corrosion resistance of mild steel—**

A. K. Moss (Australasian Corrosion Engineering, **9**, No. 1, 19, 1965). Mechanism of corrosion, effect of painting and galvanizing, high strength low alloy steels, effect of copper on strength of mild steel, weldability of copper bearing steels. Three tables, 6 figures and 12 references.

9. **n-Butylamine as an inhibitor for the corrosion of aluminium-magnesium alloy in hydrochloric acid solutions—**

V. K. V. Unni and T. L. Rama Char (Australasian Corrosion Engineering, **9**, No. 1, 25, 1965). n-Butylamine is a fairly satisfactory inhibitor for the corrosion of an aluminium alloy containing 1.8 — 2.7 per cent magnesium in hydrochloric acid. Cathode polarization is appreciable and is increased by the inhibitor, whereas the anode polarization is negligible. The results indicate that the inhibitor effect is essentially on the cathodic reaction. One table each on inhibitor efficiencies and cathode polarization; 12 references.

10. **Corrosion and the field engineer (2)—**

M. S. Haque (Corrosion Prevention and Control, **12,** No. 3, 21, 1965). Field protection of pipework, flanges and heat exchangers; anti-corrosion packaging; periodic servicing. One table, a chart and 6 references.

11. **Electrical technique protects aluminium—**

(Corrosion Prevention and Control, **12,** No. 3, 26, 1965). The pH of the medium is a controlling factor when cathodic protection is contemplated for aluminium. There is prevention and acceleration of corrosion in acid and alkaline environment respectively.

12. **The anode behaviour of nickel in electroplating—**

W. W. Sellers and F. X. Carlin (Plating, **52,** 215, 1965). This paper cites the deficiencies of regular grade electrolytic nickel and traces the steps taken to develop a better material. The incorporation of sulphur gives the best performance. Three tables, 16 figures and 7 references.

13. **The performance of aluminium welds in corrosive environments—**

R. V. Blewett and E. W. Skerrey (Metallurgia, **71,** 73, 1965). Experience with aluminium and its alloys, welded and unwelded, has shown the good performance of various grades of pure aluminium, aluminium-magnesium alloys and aluminium-magnesium-silicon alloys under several exposure conditions. Seven tables, 10 figures and 31 references.

14. **How to approach a corrosion problem—**

D. W. McDowell (Materials Protection, Vol. 4, No. 3, 19, 1965). Playing the detective, aces up the sleeve, two classes of problems, reliable data from field tests; references.

15. **Studies in corrosion of stainless steels in potassium ziroconium fluoride solution and slurry containing potassium zirconium fluoride, silica, potassium fluosilicate and potassium chloride—**

P. R. Shibad and J. Balachandra (Trans. Indian Inst. Metals, **18,** 59, March 1965). Tests show that the austenitic type of stainless steels—316, 304 and 347 appear suitable for handling potassium zirconium fluoride solution as in recrystallization tanks. Type 316 SS or 347 SS seems to be satisfactory for fabrication of equipment for leaching the sintered product during the chemical processing of silicon.

16. **Corrosion of metals by liquid fluorine—**

A. H. Singleton, J. F. Tompkins and S. Kleinberg (Industrial and Engineering Chemistry, **57,** No. 3, 47, 1965). A complete set of organized data defines the effect of liquid fluorine exposure on most of the materials of construction which might be used for this service. In addition, the formation of passive films is studied, as well the effect of contamination with hydrocarbon oils.

17. **Anodised aluminium in architecture—**

(Aluminium Courier, No. 67, 4, 1964). Introduction, expected life of anodic finishes, cooperation between architect and suppliers, manufacture and quality control; illustrations.

18. **Electroforming of nickel on ceramic—**

L. Missel, M. E. Shaheen and R. Taylor (Plating, **52,** 35, 1965). A method involving sintering of a silver-glass formulation on the ceramic, followed by electroforming of nickel and machining the nickel to final size was adopted and is being used in production. Masking techniques were devised to reduce the amount of machining required to a minimum. This work was taken up in connection with the requirements for missile and space applications.

19. **New applications of electroless nickel plating—**

D. Willson (Plating, **52,** 55, 1965). The electroless nickel plating process is reviewed, including comparison of electroless and immersion plating, the mechanism of the catalytic reaction and the physical and chemical properties of the deposit.

20. **The Mechanism of electrophoretic deposition—**

D. R. Brown and F. W. Salt (J. Applied Chem., **15,** 40, 1965). The conditions under which electrophoretic deposits can be formed from suspensions of a number of metallic and non-metallic materials have been established, and the zeta-potentials of the materials have been measured. The mechanism of the process has been discussed. Three tables, 5 figures and 25 references.

21. **Nickel-cobalt-tungsten ternary alloy deposition from the pyrophosphate bath—**

(Miss) M. Sarojamma and T. L. Rama Char (Metal Finishing, **63,** No. 2, 71, 1965). The pyrophosphate bath has been found to be suitable for the production of satisfactory deposits of nickel-cobalt-tungsten ternary alloys, dull grey

to semi-mirror bright in appearance, in the composition range 16-53 nickel, 18-67 cobalt and 7-35 per cent tungsten. One table on effect of variables on deposit composition, cathode efficiency and cathode potential.

22. **A hard face for aluminium—**

C. R. Kliemanna (Products Finishing, 29, No. 4, 66, 1965). The special anodizing technique called "hardcoat" results in a thick, dense anodic coating that has excellent resistance to abrasives and corrosives, and good dielectric qualities. Here's how it is applied in precision applications.

23. **Electrodeposition of copper-nickel alloy—**

(British patent 957, 808). Copper-nickel alloys are deposited from a citrate bath containing saccharin. It is possible to electroform ductile alloy foil containing up to 70 weight per cent nickel.

24. **New uses for electroless chemical plating—**

D. Fishlock (Metalwkg Prod, 108, 79, 1964). Refers to the extended use of electroless deposits, including copper, on substrates of unusual materials such as ethyl silicate bonded refractory mouldings, fused silica, piezo—and ferro-electric compositions, soda and borosilicate glasses, epoxy resin varnished surfaces, diallyl phthalate etc. Catalysts and surface sensitizing agents are now in use which enable through-plating, for example, on the walls of a hole 0.015 inch diameter and 1.5 inch long bored through a phenolic resin rod.

25. **The art of electroforming—**

E. C. Barrett (Metal Finishing J, **11**, 47, 1965). Introduction, applications and advantages, production methods, the master, solutions, the electroform.

26. **Ion exchange in the metal finishing industry—**

L. E. Figgess (Metal Finishing J, **11**, 69, 1965). Introduction, the ion exchange process, suggested applications.

27. **Technical developments of 1964—**

N. Hall (Metal Finishing, **63**, No. 1, 44B 1965). Review under degreasing the cleaning, pickling and bright dipping, polishing and barrel finishing, anodizing, metallic coatings, metallizing-electroforming-vapour coating, conversion films-corrosion prevention, testing and control, miscellaneous; 385 references.

28. **Colouring copper and its alloys. A black anodic finish—**

R. L. Seth, P. N. Namboodri and P. B. Mathur (Metal Finishing, **63**, No. 1, 45, 1965). Brief report on anodic coating from a bath containing copper sulphate, rochelle salt and potassium hydroxide.

29. **The mechanism of chromium deposition. A review of modern concepts—**

N. E. Ryan (Metal Finishing, **63**, No.1, 46; No. 2, 73, 1965).

30. **Science for electroplaters 93, 94, Chromium analysis—**

L. Serota (Metal Finishing, **63**, No. 1, 54; No. 2, 75, 1965). Oxidation, fluorides and fluosilicates; control, bent cathode, Hull cell, cleaning effect; passivation, bent cathode in Hull cell, total current, covering power.

31. **Electrostatic varnishing—**

H. Siener (ETZ—Eleckrotech, **Z, 16,** No. 18, 539, 1964); abstract in Rev. Met. Literature, **22,** No. 2, M12-14599, 1965). An account of electrostatic varnishing under: historical development; characteristics and modes of operation of stationary and mobile installations; review of safety measures, possibilities and limits.

32. **Titanium hardcoat resists galling—**

(Iron Age, **194**, No. 21, 110, 1964). Use of a titanium hardcoat process, a hard anodic coating, on bearing and other surfaces where galling or seizing is a problem. Rotating beam fatigue test results on uncoated and hardcoated specimens indicate increased fatigue life of the latter. Wear tests also showed longer wear life for lubricated bearings.

33. **Measuring the porosity of aluminium coatings on steel—**

L. E. Helwig and M. V. Murry (Electrochem. Tech., **3**, 26, 1965). Two methods are described: one relates coating porosity to the current flowing when the sample is anodized in a sulphuric acid-sodium chloride solution; the other involves dissolving the steel substrate from the coating and observing the porosity microscopically. Three tables, 8 figures and 10 references.

34. **Ion plating—**

(Products Finishing, **29**, No. 6, 56, 1965) New space-age electrodeposition process: evaporating metals in an inert gas atmosphere—introduction, equipment, variables, advantages.

35. **Electroplating applied to printed circuit production—**

B. H. S. Day (Plating, 52, 228, 1965). Newera for electronics, materials, electroplated connections through holes, chemical treatments, electroplating processes, soldering, electrical contacs, electroplating solutions.

36. **Chemical control and research in the metal finishing industry—**

R. K. Grassby (Electroplating and Metal Finishing, **18,** 77, 1965). This article, which is directed principally to management, demonstrates that a chemical laboratory is a necessity in modern manufacturing and metal finishing industries. Different stages are discussed: control, trouble shooting and development research.

37. **Methods of rating decorative electrodeposits—**

F. A. Lowenheim (Plating, 52, 131, 1965). Brief review of methods that have been or are being used, and detailed discussions of 2 methods. Four tables and 23 references.

38. **Electroplating in the space industry—**

L. Missel (Metal Finishing, 63, No. 2, 45 No. 3, 50, 1965). Introduction, thermal shock protection; thermal control, thin films for equilibrium temperature control, high emittance surfaces, lubrication.

39. **Electrocoating: New method in organic finishing—**

H. F. Reves (Metal Finishing, **63,** No. 2, 59, 1965). Introduction, development, technical process, process flow, range of power and other requirements, some process advantages, primer characteristics, electroplating comparisons, future development, limitations.

40. **Electrodeposition of zinc-nickel alloys. Coatings for corrosion protection of steel—**

L. Domnikov (Metal Finishing, **63,** No. 3, 63, 1965. Introduction, corrosion resistance, cyanide electrolytes, ammonia solutions, anodes. Three tables, 2 figures and 11 references.

41. **Science for electroplaters 95. Cadmium—**

L. Serota (Metal Finishing, 63, No. 3, 73, 1965). Function, cyanide baths, throwing power, brighteners, stripping.

42. **Nickel plating in telecommunication industry—**

S. Krishnamurthy (Indian and Eastern Engineer, **107,** 221, 1965). Discussion of the broad aspects of nickel coating as applicable to the various telecommunications equipment including problems encountered in the finishing of components. One table on comparative nickel specifications.

43. **Cadmium-titanium plating: An improved process for protecting high strength steels—**

D. M. Erlwein and R. E. Short (Metal Progress, 87, No. 2, 93, 1965). R. E. Short (Metal Progress, 87, No. 2, 93, 1965). Description of the process; 1 table and four figures.

44. **Decorative and protective finishes produced on aluminium by hard anodizing—**

B. A. Scott (Trans. Inst. Metal Finishing, 43, pt. 1, 1. 1965). The effects of anodizing 99 per cent aluminium in sulphuric acid at -5 to +15C and 20 to 80 asf for 20 to 80 minutes have been studied, with particular reference to appearance and resistance to abrasion. Three tables, 5 figures and 12 references.

45. **The electrodeposition of copper from non-aqueous solutions: I. General review and preliminary studies; II. The acetic acid-pyridine system—**

I. A. Menzies et al, and I. A. Menzies and T. Broughton (Trans. Inst. Metal Finishing, **43,** pt. 1, 9, 24, 1965).

46. **The electrocrystallization of lead from a pyrophosphate electrolyte—**

M. A. Loshkarev and T. F. D'yachenko (J. Appl. Chem., USSR, 37, No. 1, 79, 1964). Report of plating from solutions containing lead nitrate and potassium pyrophosphate; polarization data.

47. **Using low-carbon stainless—**

J. O. Edstrom and L. Lungberg (Chem. Eng., 72, No. 2, 184, 1965). Corrosion resistance of low carbon stainless steels and their uses in the chemical process industries.

48. **Elecrtical materials in low current technology—**

W. H. Abbott and H. R. Ogden (Battelle Tech. Review, **14,** No. 3., 17, 1965). Discusssion of the causes of failure of various types of contacts and factors involved in designing materials for improved devices. Two tables, 3 figures and 7 references.

49. Induction heating: A different way to cure paint—

O. M. Rennells (Products Finishing, **29**, No. 6, 34, 1965). Not a 'cure-all' but a specialised, high-speed method that has great potential when it is applicable.

50. The Nickel silvers—

K. T. Rowland (Copper, No. 23, 14, 1965). Introduction, advantages and applications. One table on compositions and available forms; figures.

51. Hydrogen embrittlement of high-tensile steels during chemical and electrochemical processing—

L. E. Probert and J. J. Rollinson (Metal Finishing J, **11**, 103, 1965). Detailed report of experimental work; one table and 21 references.

52. Do you know your way around fixed capacitors?—

F. G. Gore (Electro-Technology, **8**, 295, 1965). Capacitors perform many functions and each one is designed to excel in a specific application. This article endeavours to help the designer find his way among the variety of capacitors being manufacutured these days. One table and 8 references.

53. Electrolytic chlorine and caustic soda industry in Japan II.—

H. Tsukada (J. Eelctrochem. Soc., Japan, **32**, 63, 1964). Continuation of review: consumption figure, price and quality; typical cells in Japan; plant capacity and production; figures and tables.

54. The chlor-alkali industry—

H. A. Sommers (Chemical Engg. Progress, **61**, No. 3, 94, 1965). A complete review of the factors affecting costs in this important area of the CPI including details and operating characteristics of the major cells now on the market. Two tables, 18 figures and 37 references.

55. Chelation chemistry—its importance to water treatment and chemical cleaning—

W. E. Bell (Materials Protection, **4**, No. 2, 78, 1965). Describes use of chelation chemistry in the field of water treatment and chemical cleaning where removal of water deposits and corrosion control are of utmost importance.

—T. L. R.

(B) Electrometallurgy

1. Stress-corrosion cracking—

R. N. Parkins (Metallurgical Reviews, **9**, 201-261, 1964). Review: introduction, intergranular and transgranular cracking, effects of stress and plastic strain, dislocations and stress-corrosion cracking, electrochemical aspects of stress-corrosion: 120 references.

2. Industrial high-temperature applications of nickel-rich alloys—

J. E. Wightman (Foundry Trade J, **117** 431, 1964). Detailed attention is given to specific industrial uses in power units—gas turbines and piston engines—and the hot working tools used in die-casting and forging.

3. Electrowinning molybdenum and tungsten—

D. H. Baker (J. Metals, **16**, 873, 1964).

4. Open-hearth steel from an all-scrap charge—

L. B. Lindemuth (J. Metals, **16**, 891, 1964). The no-iron open-hearth steelmaking practice utilizes an electric furnace-type scrap charge, coke, and oxygen-natural gas roof burners.

5. Molten-salt electrorefining of uranium—

F. R. Cattoir and T. A. Sullivan (U. S. Bur. Min. Rep. Invest, No. 6507, 1964); abstract in J. Appl. Chem., i-127, 1965. Commercial uranium metal was electrorefined to a high-purity product, containing less than 30 ppm of impurities, using molten salt electrolyte-lithium/sodium, potassium and uranium chlorides in an inert atmosphere cell.

6. Use of mercury in electrometallurgy—

G. Jangg (Chem-Ingenior-Tech, **36**, 681, 1964). Use of liquid mercury as electrodes in the electrolytic extraction and refining of sodium, manganese, arsenic and iron; use of amalgams as reducing agents in cementation operations and for the reduction of metal chlorides in the extraction of titanium, zirconium, uranium and thrioum; separation of metals by amalgamation; fabrication of metal alloy powders and sintering of metal powders suspended in mercury; 35 references.

7. Causes and forms of losses of precious metals in refining slags—

S. S. Pyshov, N. I. Utkin and F. M. Ananyev (Izv Vuz Tsvetnaya Met, No. 3, 73, 1964); abstract in Rev. Met. Literature, **22**, No. 1, MO3-131142, 1965). Visual, laboratory and