ABSTRACTS

1. **Nickel-cadmium batteries —**

(Inco-Mond Magazine, No. 15, 9, 1960). Introduction, construction - three types of plate, the cell assembly, the electrochemical process, choice of plate, matters of fact.

2. **Influence of oxidation ratio of cast magnetite electrode on its electrochemical properties —**

T. Nagai, T. Ito and T. Takei (J. Electrochem. Soc, Japan, **27**, E233, 1959). Electrode potential and polarization curves for magnetite electrodes in sodium chloride solutions, and anodic corrosion tests in chlorate solutions have been presented in 7 figures. It is concluded that an electrode of stoichiometric composition Fe_3O_4 is suited best, as an anode in the electrolytic production of chlorate, among the iron oxide electrodes of various compositions.

3. **Influence of current forms on anodic oxidation of aluminium in sulphuric and oxalic acids —**

S. Tajima et al (J. Electrochem. Soc, Japan, **27**, E262, 1959) Anodizing by interrupted current gives, in general, oxide films of the best quality as compared with other possible wave forms including direct current when the positive current density and the total current are the same.

4. **Pitting corrosion - cause, effect, detection and prevention —**

F. B. A. Robinson (Corrosion Technology, **7**, 237, 1960) Discussion of pitting corrosion in general; results of research work on the corrosion pitting of stainless steels.

5. **Studies on the corrosion of titanium —**

R. Otsuka (Sci Papers, Inst. Phys. and Chem. Res, Tokyo, **54**, No. 1, 97, 1960). The corrosion of titanium in hydrochloric and sulphuric acids has been investigated. In the former acid an intermediate corrosion product, titanium hydride, prevents further corrosion of the metal. Anodic protection was found extremely effective for titanium in both the acids.

6. **Inhibition of acid attack on steel by heavy metal ions —**

J. A. Shropshire (J. Electrochem. Soc, **107**, 730, 1960). Ions of lead, tin and cadmium were shown to inhibit the dissolution of steel in acid solutions in the absence of metal plating. A mechanism was postulated whereby sulphide ions produced by metal dissolution combined with the heavy metal ions to form a protective coating on the dissolving surface. The order of effectiveness of inhibition of ions of lead, tin and cadmium was shown to coincide with the order of solubility of the respective metal sulphides.

7. **The corrosion of metals —**

(Corrosion Prevention and Control, **7**, No. 9, 31, 1960). An account of the research investigations on corrosion currently being carried out by the National Chemical Laboratory, England.

8. **Corrosion tests and the interpretation of results —**

E. A. Ollard (Corrosion Prevention and Control, **7**, No. 9, 37, 1960).

9. **Corrosion problems and their treatment. I.—**

(The Corrosion Engineer, **2**, No. 9, iv, 1960). First of a series of articles: introduction, corrosion techniques. Table to show various structures and materials attacked by corrosion and the relative merits of anti-corrosion techniques.

10. **Anodic protection: How good is it?—**

(Chem. Engg., **67**, No. 19, 218, 1960). In spite of severe limitations anodic protection is a powerful new tool for controlling process corrosion with impressed currents. The paper discusses anodic protection with a potential-pH diagram showing the regions of immunity or cathodic protection, corrosion and passivity or anodic protection in the case of iron in acid solutions.

11. **Selenites and tellurites as corrosion inhibitors —**

B. Dev and B. D. Jain (J. Sci. and Ind. Res, **19B**, 408, 1960). Potassium selenite and tellurite in concentrations of 0.05 and 0.2 per cent respectively have been found to inhibit the corrosion of steel by tap water.

12. **Applications of electrical resistance corrosion probes—**

A. J. Freedman (Ind. and Eng Chem., **52** 10, 63-A, 1960). Some helpful hints for selecting

and installing corrosion probes, and pointers on collecting and interpreting the data.

13. **Corrosion engineering: cathodic and anodic protection of metals—**

J. Sundararajan and T. L. Rama Char (Current Engineering Practice, **3,** No. 4, 7, 1960). The prevention of the corrosion of metals by cathodic and anodic protection has been discussed with special reference to principles, design, applications and economics. Two tables giving performance data for galvanic and impressed current anodes, 3 figures and 41 references.

14. **Corrosion prevention in the aerospace industries—**

R. A. Cole (Corrosion Technology, **7,** 320, 1960). Introduction, stainless steel, light alloys, cladding, paints, anodic coatings, spray coating, classes of aircraft; bibliography.

15. **Weapon in the fight against rust—**

(Copper No. 10, 24, 1960). In all forms of outdoor structural work, the addition of a small percentage of copper to the iron or steel used for such purposes can, by the reduction of rusting, effect valuable economy in maintenance.

16. **Inhibitors of the corrosion of iron. I. Effect of the cation. II. Efficiency of the sodium, calcium and lead salts of long chain fatty acids—**

I. P. Beckmann and J. E. O. Mayne, II. J.E.O. Mayne and E. H. Ramshaw (J. Appl. Chem., **10,** 417, 419, 1960).

17. **The protection of iron and steel by aluminium coatings—**

D. R. Adrews (Metallurgia, **62,** 153, 1960). Introduction, metal spraying, hot dip aluminising, cladding, casting aluminium around steel, electroplating, calorising.

18. **The throwing power of nickel and other plating solutions—**

S. A. Watson (Trans. Inst. Metal Finishing, **37,** 28, 1960). The throwing power of citrate, flouoborate, all-chloride and high-speed nickel solutions, as determined with the open Hull cell, showed a moderate improvement compared with that of the Watts Solution. The relationship between levelling power and throwing power is discussed, and the potential conditions necessary for simultaneous achievement of high values in both properties are defined.

19. **Use of disodium m-benzenedisulfonate as a hardening agent in a Watts nickel bath—**

W. H. Metzer, P. A. Krasley and F. Ogburn (Plating, **47,** 285, 1960). The hardness of nickel coatings had a maximum value of 350 VHN at a concentration of 0·3 g/l of the addition agent.

20. **Practical hints for electro-cleaning with simultaneous copper plating—**

R. Grauer (Electroplating, India, **2,** No. 2, 8, 1960). Bad cleaning—causes, fault in copper deposits and its causes, corrections, appearance of anodes.

21. **Electrodeposition of metals from aqueous fluoride solutions—**

A. N. Kappanna and E. R. Talaty (Electroplating, India, **2,** 16, 1960). Concluding part: titanium, tungsten, uranium, vanadium, zinc, zirconium; potential measurements; 40 references.

22. **How to finish magnesium—**

J. A. Stevens (Products Finishing, **24,** No. 11, 1960). Pretreatments and paints for decorative and utilitarian applications; preventing dissimilar-metal corrosion.

23. **Copper-plating steel in ammoniacal electrolyte—**

V. D. Kamkin et al (Zh. prikl, khim, **33,** 1215, 1960). Plating of copper on steel from an ammoniacal complex of univalent copper: cuprous chloride 106, ammonium chloride 132 and ammonia 52 g/l).

24. **Alkaline solution of metal chelate compound as an electroplating bath—**

T. Atoda (Sci. Papers, Inst. Phys. and Chem. Res, Tokyo, **54,** No. 1, 129, 1960). Series of baths composed of EDTA. Cu-EDTA. disodium salt-NaOH-borax produce bright copper electroplates at cathode current densities of 0·8—1·3 amp/dm^2 and electrode efficiencies close to 100 per cent.

25. **Direct nickel plating of zinc—**

Brit. Pat. 837, 050 (M. L. Alkan Ltd, inventor A. Mohan). Zinc or zinc-base alloys are plated with bright nickel directly from a solution containing nickel sulphate 75-300, boric acid 10-50, 2-mercaptobenzimidazole (as a brightener) 0·01-0·5, a carrier promoting ductility of the deposit (preferably a saccharin, a naphthalene mono-, di- or tri-sulphonic acid and/or a sodium salt of these acids) 2-20 g/l, and a water-soluble salt (preferably a sodium salt) or derivative of EDTA equal or equivalent to 20-140 g/l of the acid. The pH of the solution is 3 to 6, and it preferably contains chloride ions, nickel chloride 25-100 g/l.

26. **Controlled deposits of hard chromium—**

J. D. Greenwood (Electroplating and Metal Finishing, **13,** 322, 1960). Prize-Winning paper: introduction, eliminating 'build-up', controlled deposits.

27. **Fluoborates in plating**—

F. Wild (Electroplating and Metal Finishing **13,** 331, 373, 1960). Introduction, plant, fluoboric acid, fluoborates of cadmium, copper, indium, iron, lead; lead-tin alloy, tin, nickel, zinc.

28. **Science for electroplaters. 60. Causes of poor adhesion** —

L. Serota (Metal Finishing, **58,** No. 9, 69, 1960). Embrittlement, colloid films, oxide films.

29. **Zinc coatings on iron and steel. 6— Applications of zinc coatings** —

A. K. Parker (Met. Finishing J, **6,** 345, 1960). Introduction, agriculture; aircraft; buildings; bridges and tunnels; equipment — defence, domestic and institutional, electrical and electronic ventilation and water-supply; gas works; industrial plant; marine; railways; miscellaneous; 11 references. To be concluded.

30. **Electrodeposition of nickel - copper alloys from the pyrophosphate bath** —

S. K. Panikkar and T. L. Rama Char (J. Sci. and Ind. Res, **19A,** 510, 1960). The pyrophosphate bath has been used for the electrodeposition of nickel-copper alloys. The effect of the variables on alloy composition, cathode efficiency and cathode potential has been studied, and the optimum conditions established for the production of satisfactory alloys in the composition range 18-55 per cent nickel. Efficiency and potential measurements show that cast alloy anodes are suitable. X-ray studies indicate that the alloy plates have the same structure as nickel or copper deposited from this bath. Five tables, 13 figures and 19 references.

31. **Electrodeposition of nickel-tungsten alloys from the pyrophosphate bath** —

K. I. Vasu and T. L. Rama Char (J. Sci. and Ind. Res, **19B,** 413, 1960). Nickel has been codeposited with tungsten from the pyrophosphate bath and conditions for obtaining satisfactory alloy plates with 6-53 per cent tungsten have been established. Table gives effect of variables on deposit composition, cathode efficiency and potential.

32. **Experiences in the decorative plating of zinc alloy die-cast components** —

J. Chadwick (Electroplating and Met. Finishing. **13,** 239, 1960). Prize-Winning article in Electroplating and Metal Finishing competition. Summarizes the results of investigations into the causes of, and possible remedies for, production difficulties encountered in the copper nickel-chromium plating of zinc alloy die cast components on automatic plants.

33. **The effect of electroplating on fatigue strength** —

R. A. F. Hammond and C. Williams (Metallurgical Reviews, **5,** 165-223, 1960). Review: introduction, experimental methods, chromium, nickel, cadmium and zinc, hydrogen embrittlement, corrosion fatigue, mechanism of failure, conclusion; 64 references.

34. **Pores in plates: causes and detection** —

(Products Finishing **25,** No. 1, 96, 1960). Introduction, microscope-detection method, sensitivity of ferroxyl test, influence of gas on porosity.

35. **Electrodeposition of nickel-zinc alloys from the pyrophosphate bath** —

T. L. Rama Char and S. K. Panikkar (Electroplating and Metal Finishing, **13,** 405, 1960). Nickel has been codeposited with zinc from the pyrophosphate bath. The optimum conditions have been established for obtaining satisfactory alloy deposits in the composition range 21-84 per cent nickel. Nickel and zinc anodes can be used. There were sudden changes in plate composition and cathode potential at low current densities due to the deposition of alloys of different phases as shown by x-ray studies: alpha, gamma, gamma plus delta, and delta plus eta. In the high current density range the composition of the deposit was practically constant. Seven tables, 11 figures and 19 references.

36. **Electropolishing in cyanide electrolytes** —

F. Sullivan and E. H. Newton (J. Electrochem Soc, **107,** 886, 1960). Bath composition and conditions given for silver plate, sterling silver, and other metals.

37. **The electrolytic production of sulphur-free iron** —

W. T. L. Neal, J. F. Duke and H. R Sullivan (J. Iron and Steel Inst, **196,** part 2, 131, 1960). A patented process for the production of iron with a sulphur content below 5 ppm is described. The method involves electrolysis of ferrous chloride solution across an ion exchange membrane separating a two-compartment cell, and is capable of producing 500-600 gm of iron in 7 hours.

38. **Electrolytic production of 2 : 4-diaminophenol—A photographic developer**—

H. V. K. Udupa, G. S. Subramanian and K. S. Udupa (Research and Industry, **5**, 309, 1960). A simplified cell design with a rotating cat ode, low-cost starting material, reuse of spent catholyte and a yield of 60 65 per cent are some of the attractive features of the new process reported for producing 2 : 4 — diaminophenol sulphate. For a plant producing annually 15,000 lbs of the material, the cost of production works out to Rs 6.30 per lb which is the lowest compared to other chemical and electrolytic methods.

39. **The theory and practice of vacuum melting —**

O. Winkler (Metallurgical Reviews, **5**, No, 17, 1-117, 1960). Review with 106 references.

40. **What vacuum metallizers should know about electrostatic spraying —**

J. Scharnberg and T. E. Hayden (Products Finishing, **24**, No. 11, 58, 1960). Principles of electrostatic painting; how the equipment operates; tips on how to get best results; advantages and disadvantages.

41. **Electrolytic zinc pilot plant—**

R. E. Lund (Chem. Engg. Progress, **56**, No. 8, 54, 1960). This detailed description of an electrolytic zinc pilot plant fills the gap between fundamental electrolytic zinc process chemistry and commercial know how. Solution purification, pilot plant design, cell performance, summary; flow sheet.

42. **Modern industrial uses of the platinum metals—**

W. Betteridge and D. W. Rhys (Met. Industry, **97**, 163, 183, 1960). Introduction, refining and processing, properties, metallurgical applications; chemical and petroleum industries, glass industry; to be continued.

43 **Graphite - its manufacture and uses in metallurgy—**

R.A.P. Misra (Chem. Age of India, **11**, 437, 1960). Introduction, manufacture, electrodes and other graphite products, new materials, electric furnace; 3 figures and 5 tables.

44. **Materials for missiles—**

(Wiggin Nickel Alloys, No. 58, 8, 1960) Introduction, material requirements, high-temperature problems effects of low temperatures, tensile strength, ductility at low temperatures, corrosion, fluorine. Table gives highest temperatures at which the best alloys can be used - light, super and refractory alloys. Calculated avarage penetration rates in fluorine, and corrosion of commercial metals and alloys by fluorine are given in two tables. Three figures cover melting points of materials, effect of sub-zero temperature on tensile strength and effect of temperature on impact strength.

45. **Production of tantalum and niobium—**

G. L. Miller (Ind. Chemist, **36**, 447, 1960). In the second part of his article the author surveys methods based on thermal dissociation, electrowinning and electrorefiining for producing high purity tantalum and niobium.

46. **Super purity aluminium—**

(Met. Industry, **97**, 223, 1 60). Introduction, available forms, properties, decorative uses, building applications, cable sheathing, electrolytic condensers.

47. **Preparation of boron by fused salt electrolysis—**

N. P. Nies (J. Electrochem. Soc, **107**, 817, 1960). Amongst various electrolytes investigated the best product purity, 97.5 per cent, was obtained with a bath containing KCl, KF and B_2O_3, treated with HCl gas.

48. **Moulds for plastics—**

(Copper, No. 10, 2, 1960). Hollow moulds electroformed from copper.

49. **The fusion electrolysis of titanium—**

W. J. Kroll (Chemistry and Industry, No. 43, 1314, 1960). Introduction, fusibility of the electrolyte, mixed fluoride/chloride electrolyte, physical and chemical properties of titanium halides, chemical equilibria between solid and liquid, anode chemistry, production of the cell feed, the plurivalency problem, oxide transfer, anode effect, titanium refining and winning, the sodium titanium cell; one table and eight figures.

50. **The rare-earth metals—**

F. H, Spedding and A. H. Daane (Met. Reviews, **5**, No. 19, 297-349, 1960). Review: introduction, preparation, properties, alloys, toxicity; 340 references.

51. **The Na_2SO_4 continuous electrolysis experiments using filter diaphragms at 90 amp. cell—**

T. Eguchi (J. Electrochem. Soc, Japan, **27**, E212, 1959). Sodium sulphate solution was electrolyzed with the vertical mercury cathode and lead alloy anode containing 2 per cent silver and 1 per cent tellurium. Filter diaphragms were made of PVC1 treated vinylon cloth and micro porous rubber. Catholyte and anolyte

composition and operating conditions have been given, the current efficiency being 95 per cent. Five tables cover experimental results.

52. **Investigation on the various conditions of electrolysis about the cell for the Na_2SO_4 electrolysis with filter diaphragm and mercury cathode—**

T. Eguchi (J. Electrochem. Soc, Japan, **27**, E228, 1959). The optimum conditions for electrolysis have been established. Design problems for large scale unit have been investigated. Six figures and 4 tables.

53. **Industrial hydrogen Part II—**

M.M. Sharma (Chem. Age of India, **11**, 385, 1960) Reaction of steam with carbonaceous materials ; 3 tables and 65 references.

54. **Report of the chlor-alkali committee of the industrial electrolytic division for the year 1959—**

N.J. Ehlers and C.A. Hampel (J. Electrochem. Soc, **107**, 791, 1960). E.C.S. Report: Chlorine-caustic, soda ash, miscellaneous chemicals and metals.

55. **Electrochemical fluorinator uses porous carbon anode—**

D R. Allen (Chem. Engg, **67**, No. 19, 216, 1960). Operating characteristics and schematic diagram of an electrochemical fluorinator cell equipped with a porous carbon anode Electrolyte KF 2HF, temperature 100°C, voltage 9-11 volts; products: sulphur hexafluoride form hydrogen sulphide, nitrogen trifluoride from ammonia, fluoro-organics from acetone etc. The cell is capable of continuous operation

56. **New electrode for cathode ray polarography—**

G. E. Penketh (J. Appl. Chem, **10**, 324, 1960) A new mercury electrode, the surface of which is automatically renewed between potential sweeps, is described.

57. **Irreversible thermodynamics in electrochemistry —**

A. J. deBethune (J. Electrochem. Soc., **107**, 829, 1960). The Onsager thermodynamics of irreversible processes provides a unified approach to the study of electrolytic systems out of equilibrium. Discussion under : introduction, general description of thermodynamic system, isothermal concentration cells, initial EMF of thermal cells, thermal diffusion (Soret effect), final EMF of thermal cells, values of the ionic transport entropies, ionic transport entropies, summary; 51 references.

58. **Department of nuclear power**

(Internat. Atomic Energy Bull. Special number 1960). Report of discussion on the development of nuclear power: present technical status, present costs, future cost reductions and applications in less-developed areas.

—T. L. R.