ABSTRACTS

(A) General

1. The lead-acid accumulator—XI

R. S. Mani (Accumulator, **4**, No. 1, 7, (1969). Servicing of the battery—part 1: detaied. account, with 2 figures and 2 tables.

2. Fuel Cells—

D. P. Gregory (Endeavour, **28**, No. 103, 8, 1969). Recent developments in the design of fuel cells and interesting applications: why fuel cells?, the cell system, fuel conversion systems, acid fuel cells, alkaline and molten salt electrolyte systems, fuel systems, applications; 6 figures and 11 references.

3. Corrosion behaviour of high-strength steels in marine environments—

W. W. Kirk, R. A. Covert and T. P. May (Metals Engg. Quarterly, **8**, No. 4, 31, 1968). Performances of several maraging steels and quenched and temporal steels in sea water and marine atmospheres is described. Cathodic protection is shown to be an effective method to minimize general and localized corrosion, to suppress stress-corrosion cracking and to improve corrosion fatigue strengths. The danger of hydrogen embrittlement resulting from excessive cathodic polarization of some alloys is discussed. Thirteen tables, 7 figures and 6 references.

4. Connections between polarization resistance and corrosion rate of metals—

M. Prazak (Werkstoffe u. Korrosion, **19**, 845, 1968). The validity of a simplified relation between measured polarization resistance and corrosion rate of some metals has been empirically evaluated, for steel, copper, zinc and silver in their active states. The proposed a.c. method is suitable principally for technical measurements, the error being $\pm$ 15 per cent; one application might be corrosion monitoring over extended periods of time, where low frequencies are useful.

5. The electron microscope as a tool in corrosion research.—

R. Grauer (Werkstoffe u. Korrosion, **19**, 848, 1968). Possibilities and limitations of the individual electron-optical methods of investigation.

6. Here's line-up of corrosion equipment.—

J. D. Palmer (Canadian Chem. Processing, **52**, No. 10, 81, 1968). Because he is trouble-shooting problems and trying to prevent new ones, the corrosion engineer must understand and use a sizeable array of laboratory and field instruments. This is outlined here under information, avoid polarization, prefer a rugged pH meter, completing the apparatus. Table on instruments for corrosion studies and characteristics of potentiostats; illustrations.

7. The application possibility of mathematical statistical methods for the evaluation of field corrosion survey.—

G. Praznovszky (Korrozios Figyelo, **8**, No. 5, 145, 1968). Title in English; 6 references.

8. Corrosion problems encountered in the building industry.—

L. H. Everett (News Letter, I. Corr. Tech., No. 17, 5, 1968). The use of aluminium and stainless steel in curtain walling, bimetallic corrosion, prevention of cavitation damage; corrosion and protection of steel and aluminium in concrete and plasters: discussion.

9. Use of copper base materials in corrosive environments—past, present and future.—

J. B. Cotton (News Letter, I. Corr. Tech., No. 17, 15, 1968). Copper and its alloys in the condensing plant: application in the chemical plant and the domestic back boiler: corrosion and cost considerations.

10. Ellipsometry.—

P. C. S. Hayfield (Werkstoffe u. Korrosion, **19**, 950, 1968). Principles of the method, measuring set-up, and examples concerning the application to the corrosion field, particularly in connection with the formation of passive layers. This is stretched to chronoellipsometry involving the simultaneous measurement

of the changes of electrical and optical properties during an electrochemical reaction.

11. Radiotracer methods of corrosion testing.—

J. G. N. Thomas (Werkstoffe u. Korrosion, **19**, 957, 1968). The equipment is described for measurements under 3 groups—post-immersion counting, depletion techniques and immersed counting.

12. Corrosion protection of electronic equipment.—

J. A. Barbaro (Australasian Corrosion Engg., **12**, No. 12, 5, 1968). Introduction, environmental conditions, potting and encapsulating materials, encapsulating and sealing materials, adhesives and adhesive tapes and paper products, printed circuits, relevant specifications information, conclusion; 4 tables and bibliography.

13. Corrosion control by design—

F. O. Howard (Australasian Corrosion Engg., **12**, No. 12, 23, 1968). Corrosion and its prevention, design methods.

14. Corrosion problems in aircraft. Part V.—

(HTS Digest, 9, No. 1, 32, 1969). Corrosion prone areas; exhaust trail areas, engine frontal areas and cooling air vents, battery areas and vents, lavatories—galleys and cabin floors, wheel wells and landing gears, control surface recesses, spot-welded skins, hinges, lap joints, fluid entrapment areas, electronic package compartments, control cables; figures.

15. Failure mode due to corrosion.—

E. Takano and K. Mano (IEEE Trans. Parts Mater. Packing. PMP-4, No. 2, 51, 1968); abstract in Electro-Technology, **13**, LXIII, 1968. Failure mode due to corrosion at the contact surfaces of static contacts in connectors and mechanical wiring is described.

16. Investigation of cathodic processes in the corrosion of metals with hydrogen polarization under conditions of continuous renewal of their surface.—

N. D. Tomashov, M. M. Strukov and L. P. Vershimina (Protect Metals—USSR, English translation, 3, No. 5, 457, 1967). A study is reported of the influence of the continuous renewal of the metallic surface—by cleaning, on the cathodic process of hydrogen liberation. The tests were conducted on lead, iron and three other metals in 1N sulphuric acid at 20°C in argon.

17. Billion dollar battle against corrosion.—

(Anti-Corrosion Methods and Materials, **16**, No. 1, 22, 1969). Aircraft corrosion problems faced by North American Rockwell Corporation in California: the many faces of corrosion, aircraft corrosion, new substitutes, stress corrosion, rigorous texting, unusual problems.

18. The economics of corrosion and corrosion control.—

A. Holme (Anti-Corrosion Methods and Materials, **16**, No. 2, 12, 1969). Economic effects of corrosion and corrosion control in Britain and the U.S.A; methods of accounting by which the time costs of corrosion and its control can be measured; economic analyses to shop the effects of improved methods of corrosion control on the economy; 3 figures and references.

19. The microbiology of steel mills and its relation to sheet corrosion.—

E. C. Hill and I. O. Penberthy (Metals and Materials, **2**, 359, 1968). Introduction; microbiological results on rolling coolants and associated wash waters; biocide compatibility—phosphating efficiency, corrosion effects; 3 tables, 4 figures, 6 references and appendix A-C.

20. High performance coatings for corrosion resistance in the chemical industry.—

D. M. Martin (Australasian Corrosion Engg., **13**, No. 2, 7, 1969). Important aspects of designing a coating system for the protection of industrial plant; correct coating selection, surface preparation and application; classes of coatings and their characteristics; cost comparison of typical maintenance coatings; value of preventative maintenance, 3 tables.

21. Corrosion problem in aircraft. Part VI.—

(HTS Digest, 9, No. 2, 29, 1968). Corrosion removal; aluminium, magnesium, iron and steel; figures.

22. The protection of pipes and pipelines. An "Anti-Corrosion" review.—

(Anti-Corrosion Methods and Materials, **16**, No. 3, 11, 1969). Cathodic protection, anticorrosive pipe wrapping, outer-wrap, polythene sleeving, heat-shrinkable protection products, polyethylene sleeves, finish for insulation, ultra-

sonic thickness meter, Araldite in gas lines, insulating joints, insulator tester; illustrations.

23. Pipeline coatings and corrosion prevention.—

H. M. Hatley (Anti-Corrosion Methods and Materials, **16**, No. 3, 22, 1969). Introduction, typical pipeline coatings, inspection, storage of pipes.

24. The use of models for the design of pipeline cathodic protection systems.—

J. Nekoksa(Anti-Corrosion Methods and Materials, **16**, 3, 24, 1969). Introduction, model size, conversion of test values, potentiometer method, 3 figures, illustrations and 2 references.

25. Review of the electrochemical methods for the evaluation of corrosivity, passivity and the effect of inhibitors.—

J. Harvath, L. Hackl and A. Ranscher (Korrozios Figyelo, **9**, No. 1, 6, 1969). Ten figures and 7 references.

26. Some production plating problems and how they were solved. Part 20.—

S. Heiman and I. Cross (Plating, **55**, 1180, 1968). More on Finagle's laws, practical approach in solving some finishing problems, stripping and reclaiming silver, trouble from oversize rectifier, pipe dopes and assorted complications, plating on leaded copper.

27. Bibiliography of metal finishing wastes for 1967.—

D. G. Foulke (Plating, **55**, 1221, 1968). 87 references, with addendum to 1966 and 1965.

28. Study of electroplating processes for establishing their mathematical models, II.—

V. P. Malyshev (Tr. Kazan Khim.—Tekhnol. Inst., No. 36, 215, 1967); Chem. Abs., **69**, 82795, 1968). The possibility of using the Box-Wilson method to find mathematical models of electroplating processes is illustrated with reference to nickel plating.

29. Die cyanidfreie verzinkung.—

R. Siegburg (Galvanotechnik, **59**, 951, 1968). Review of the development of cyanide-free zinc plating; advantages of modern process, use of organic complex forming agents, waste problems.

30. Precision deburring by ECD.—

G. Michaels (Products Finishing, **33**, No. 4, 48, 1969). Electrochemical deburring: mechanism, electrode design, electrolyte, operating conditions, costs, outlook for future.

31. Two-shot technique adds style to plated plastics.—

R. J. Belner (Products Finishing, **33**, No. 4, 60, 1969). Here's how EMC plastics met two challenges with new selective plating techniques.

32. New chromium plating process desposits durable plate quickly.—

N. R. Bharucha and J. J. Ward (Products Finishing, **33**, No. 4, 64, 1969). Plating chromium from trivalent state, using baths containing organic solvents—dimethylformamide, produces deposits that resemble polished stainless steel; accelerated tests indicate excellent corrosion resistance. Details concerning bath operation, properties of deposits and cost; 7 figures and 2 references.

33. Surface coatings: progress in chemistry and technology.—

L. A. O'Neill (Chemistry in Britain, **5**, No. 1, 10, 1969). Types of paint, the pigment, calculation of colour formulations, dispersion; illustrations.

34. Electroforming.—

(Machinery, **110**, 732, 1967). Some of the components now being made by electroforms, including electronic screening cans of thin nickel, with sharp corners, which would be difficult to make by any other process, are described.

35. Uber einige Fortschritte der Galvanotechnik, I.—

H. Benninghoff (Galvanotechnik, **60**, 2, 1969). Review of international technical literature in metal finishing: blasting, polishing and buffing, chemical and electrolytic treatments, electroplating on aluminium and less common metals. Six tables, 11 figures and bibliography.

36. Galvanoplastik als Herstallungsverfahren fur Schallplatten.—

A. F. Bogenschutz (Galvanotechnik, **60**, 88, 1969). General description of the manufacture of gramaphone records by electroforming.

37. Vapour deposition of metal by disproportionation reaction.—

D. R. Gabe (Metal Finishing J., **14**, 393, 1968),

Characteristics of disproportionation reactions are outlined and a general thermodynamic treatment is suggested. Examples cited include refining and vapour phase coating processes involving carbonyl, halide and sub-halide carrier phases. Applications in the field of metal finishing are discussed. One table, 9 figures and 12 references.

38. Measurement of the thickness of electrolytic coatings by means of atomic radiation.—

H. Langel (Metal Finishing J., **15**, 9, 1969). An account of the measurement of sheet thickness by means of atomic radiation by the transmission radiation process; measurement of the thickness of coatings by the backscattering method; 5 figures.

39. Nickel-cobalt-iron deposition. Ternary alloys from sulfate baths.—

R. Sivakumar and T. L. Rama Char (Metal Finishing, **67**, No. 4, 66, 1969). The sulphate bath has been shown to be suitable for the electro-deposition of ternary alloys of nickel-cobalt-iron containing iron 9-50, cobalt 5-55 and nickel 6-63 per cent at a cathode efficiency of 75-95 per cent up to a current density of 20 amp/dm^2. One table containing effect of variables on deposit composition, cathode efficiency and cathode potential; 16 references.

40. Nickel-cobalt-cadnium deposition. Ternary alloys from sulphate baths.—

R. P. Dambal and T. L. Rama Char (Metal Finishing, **67**, No. 5, 68, 1969). Ternary alloys of nickel-cobalt-cadmium containing nickel 8-74, cobalt 12-72 and cadmium 4-78 per cent have been satisfactorily plated from the sulphate bath at a cathode efficiency of over 90 per cent up to 100 amp/dm^2. One table showing the effect of variables on deposit composition, cathode efficiency and cathode potential.

41. Twenty years of electrodeposition research reviewed.—

T. L. Rama Char (Electroplating and Metal Finishing, 22, No. 5, 17, 1969). Review of the work done in the author's laboratory: metals, alloys and plating baths; salient features; highlights; conclusion. One table and 133 references.

42. Ammonium fluosilicate electrolyte for cadmium plating.—

N. P. Gnusin and V. Y. Bartenev (Izv. Sibirsk. Otd. Akad. Nauk S.S.S.R., Ser Khim. Nauk, U.S.S.R., No. 14, 127, 1967); Metal Abs., **1**, 1260, 1969. The advantages offered by a cadmium plating electrolyte based on ammonium fluosilicate are discussed and contrasted with conventional cadmium plating solutions.

43. Electrodeposition of zinc from a triopolyphosphate electrolyte.—

V. S. Galinker and A. I. Saprykin (Ukr. Khim, Zh. U.S.S.R., **34**, 4611, 1968); Zinc Abs., 27, 86, 1969. Light, brilliant deposits of zinc were obtained from an electrolyte containing zinc sulphate, sodium tripolyphosphate, dextrin an ammonium acetate.

44. Electrodeposition of metals from molten Chlorides. Part 1. Deposition of lead from the KCl-NaCl-PbCl$_2$ system.—

R. Y. Bek and A. S. Lifshits (Izv. Sibirsk. Otd. Akad. Nauk. S.S.S.R., Ser. Khim, Nauk, U.S.S.R., No. 14, 70, 1967; Metals Abs., **1**, 1260, 1968. A study is reported on the kinetics of the electrode processes involved in the electrodeposition of lead from molten chlorides, and the capacity of the double electric layer formed in this system.

45. Improved techniques for making Kovar printed circuits.—

L. C. Jackson (Products Finishing, 33, No. 6, 50, 1969). Plating the Kovar with coats of various metals in such an arrangement that bimetallic electromotive series cells assist in the etching process. Circuits as small as 0.13 mm. are being produced with amazing success. One table and 3 figures.

46. Sealing of anodic films on aluminium and its alloys.—

R. C. Spooner (Metal Finishing, **66**, No. 12 44, 1968; **67**, No. 1, 80, 1969). Introduction sealing—how and why, sealing problems, laboratory tests for sealing quality, formation of chalk, sealing and overcoating, air aging, crazing. One table, 13, figures and 24 references.

47. Safety in plating plants.—A "must" investment.—

A. W. Sheldon (Metal Finishing, **66**, No. 12, 50, 1968). Common hazards, attention to details, guidelines for storage and handling, electrical and mechanical hazards, rules for the plating lab., proper ventilation, safety programme; illustrations.

48. Tarnish prevention of copper and silver, Electrolytic treatment.—

K. S. Rajagopalan and R. Aravamuthan (Metal Finishing, 66, No. 12, 54, 1968). An effective method of tarnish proofing is by treatment in a solution containing ammonia, amine and 2-MBT. One figure, 4 tables and 34 references.

49. Technical developments in 1968. Inorganic (metallic) finishes, processes and equipment.

N. Hall (Metal Finishing, 67, No. 1, 46, 1969). Cleaning and pickling, polishing, anodizing, treatments for deposit adhesion, metallic coatings, metallizing—electroforming, vacuum coating-vapour plating, conversion coatings, testing and control, waste treatment, miscellaneous; 419 references.

50. Technical developments in 1968. Part 2.—Organic (paint) coatings, processes and equipment.—

H. Preuss (Metal Finishing, 67, No. 1, 58, 1969). Resin and other raw material developments, cleaning and prepainting—surface preparation, coatings, protection against corrosion, application, paint removal, testing, health—safety and the law; 11 figures and 260 references.

51. Bright acid zinc deposition. Cetyl trimethyl ammonium bromide.—

K. S. Indira, K. Vasanthi and K. S. G. Doss (Metal Finishing, 67, No. 1, 71; No. 2, 52, 1969). Hull cell experiments, operating conditions, maintenance and replenishment; 24 figures and 3 references.

52. Effects of chloride ion in an electrophoretic coating bath.—

T. Ito and K. Shibuya (Metal Finishing, 67, No. 2, 56, 1969). Further study of the effect of the chloride ion on the deposition mechanism and the properties of the coated film in electrophoretic coating of steel and aluminium alloys. Five tables, 13 figures and 3 references.

53. Bright acid tin deposition. Cetyl trimethyl ammonium bromide.—

K. Vasanthi, K. S. Indira and K. S. G. Doss (Metal Finishing, 67, No. 3, 46, 1969). Experimental results, mechanism of CTAB action; 25 figures and 4 references.

54. Anodized coatings on aluminium—a review. Part I: Electrolyte and alloy selection, film properties.—

L. F. Spencer (Metal Finishing, 67, No. 3, 53, 1969). Mechanism of film formation, sulphuric chromic and other anodizing baths, aluminium and its alloys, anode bath efficiency, properties of anodized coatings. Four tables, 5 figures and 11 references.

55. The electro-synthesis of organic compounds—

M. Fleischmann (Platinum Metals Review, 13, No. 2, 46, 1969). Introduction, reactions at platinum electrodes, industrial processes in operation, importance for large-scale synthesis, development of reactors and electrodes; 2 figures and 37 references.

56. Stainless steel in the chemical industry.—

S. R. Morgan (Australasian Corrosion Engg., 13, No. 1, 7, 1969). Properties of various types of stainless steel, corrosion mechanisms, corrosion resistance in industrial application; 6 tables.

57. Properties and applications of pre-painted aluminium sheet.—

C. R. Cox (Aluminium Courier, No. 84, 2, 1968). Introduction, aluminium as a material for pre-painting, paint finishes for aluminium, what weather does to paints, durability of paints, fabricating pre-painted aluminium, availability, applications; 1 table and 8 figures.

58. Lead as an anode—Part 2, 3.—

J. A. von Fraunhofer (Anti-Corrosion Methods and Materials, 15, No. 12, 4, 1968; 16, No. 1, 17, 1969). The lead-acid accumulator, lead in chloride solutions, the lead-platinum bi-electrode; continuation from Part 1; 3 tables and 76 references. Lead anodes in cathodic protection and in electrometallurgy; 95 references.

59. Antique bronze finish decorates prestige car.—

(Products Finishing, 33, No. 5, 40, 1969). Here is a description of how bronze was "antiqued" and electrostatistically sprayed with a clear protective coating for the Chrysler Imperial; finish requirements, steps, properties; schematic diagram and illustrations.

60. Anodes for electrolytic cells.—

(Brit. Pat. 1, 128, 136). Anodes for the electrolysis of halide compounds like sodium chloride are produced from an alloy of palladium 3-80 and rhodium 97-20 per cent, or of palladium 5-80 and platinum 95-20 per cent which is subjected to oxidative treatment at

1700°-1350°C in an oxidising atmosphere electrolytic oxidation in a fused salt bath.

61. X-ray analysis of crystal structures.—

M. M. Harding (Chemistry in Britain, **4**, 548, 1968). The problems of structure determination by X-ray diffraction, and the various methods employed to overcome them, are explained; 8 figures and 29 references.

62. Fluctuations of overpotential at metal cathodes and changes in surface concentration of hydrogen atmos.—

M. N. Hull and F. A. Lewis (Trans. Faraday Soc., **64**, 2472, 1968). Fluctuation of the total apparent hydrogen overpotential at platinized platinum cathodes at low current density were correlated with irregular changes of the hydrogen content of the electrode surface. The comparative lack of fluctuations at palladized palladium cathodes was attributed to hydrogen absorbed in the palladium lattice.

63. Science and technology in exploitation of natural resources in developing countries and role of consultants.—

U. P. Mullick (Science and Engineering, **22**, 27. 1969). Biref survey.

—T. L. R.

(B) ELECTROMETALLURGY AND GENERAL METALLURGY

1. Parameters affecting electron beam welding

R. D. Engquist (Materials Engg. Quarterly, **8**, No. 4, 56, 1968). Introduction, weld criteria, significance of the welding variables, experimetal procedures, analytical techniques, comparison between electron beam welding machines additional data and applications, summary; 1 table and 13 figures.

2. The influence of ausforming on the stress corrosion susceptibility of some high-strength steels—

C. N. Ahlquist (Materials Engg. Quarterly, **8**, No. 4, 52, 1968). Ausforming produces improved resistance to stress corrosion cracking in some alloy steels as measured with a constant strain bend test exposed to a 5 per cent sodium chloride fog. Three tables, 8 figures and 7 references.

3. The gain to the national economy from an improvement in the quality of iron and steel—

N. F. Sklokin and A. A. Brodev (STAL in English, No. 7. 537, 1968). Introduction, degree of uniformity of steel, metal cleanness, low-alloy, steel heat-treatment strengthening of rolled products, metals with anti-corrosion, coatings, special properties of metal.

4. Grain-boundary corrosion in zone-refined and lower-purity aluminium—

L. E. Hendrickson and M. Metzger (Trans. Met. Soc. AIME, **242**, 2329, 1968). Grain boundary attack in 16 per cent hydrochloric acid was found to be substantially the same at low penetrations in zone-refined aluminium, superior electrolytically refined aluminium, and metal with various impurities at much higher levels. Four tables, 8 figures and 14 references.

5. The hazards of mercury to metals and alloys in the process industries and some little known sources of mercury contamination—

W. B. Brooks (Corrosion, **24**, 335, 1968). Brief note with 1 table and 4 references.

6. Electric power in steel plants.—

K. S. Kuka (J. Inst. Engineers, India, **49**, No. 2, Pt. EL1, 19, 1968). This paper discusses the nature of electric power in steel plants and suggests methods which could be adopted in estimating the overall power requirements of integrated steelworks in general. Calculations of individual power demands, based on actual operations and experience obtained over a number of years, are indicated which could be a fair guide as a reference during the planning of electric power supplies for new integrated steelworks. Three tables, 10 figures and 2 references.

7. Detection and removal of iron contamination from stainless steel surfaces.—

J. Q. Lackey and M. A. Streicher (J. Materials **4**, 983, 1968). In laboratory tests the ferricyanide test was found to be definitely superior to the acetoacetanilide test in detecting iron contaminants—such as iron particles, oxides, salts and adherent metallic iron. Precautions for minimizing contamination during fabrication are described; 2 tables.

8. Platinum mining at Rustenburg—

(Platinum Metals Review, **13**, No. 1, 15, 1969). This article describes the mineral resources available, mining methods and extraction processes in use at the Rustenburg mines in South Africa.

9. Extraction metallurgy research at Warren Spring Laboratory—