ABSTRACTS

A) General

1. Fuel cells enter the market—

O. Lindstrom (Indian & Eastern Engineer, **110**, 521, 1968). An account of the development work on the Quadrus electrode and of the measures taken to adopt fuel cell batteries for submarine propulsion and traction purposes, as in trucks and mining machinery; 5 figures.

2. Review of United States fuel-cell patents issued during 1965 and 1966—

S. G. Meibhur (Electrochim. Acta., **13**, 1973, 1968). Introduction, electrodes, fuel-cell systems, electrolytes, regenerative fuel cell, liquid-fuel fuel cells, applications for fuel cells; 212 references.

3. Activity of manganese dioxide (on its battery reaction)—

A. Era (J. Electrochem. Soc. Japan, **36**, 133, 1968). Review: Introduction, chemical changes of electrolyte in dry battery during discharge, discharge product and mechanism, physical and chemical properties affecting activity. One table, 12 figures and 88 references

4. On the cupric oxalate cell (1). studies on the immersion battery using seawater as electrolyte V.—

Y. Aoki and M. Hiroi (J. Electrochem. Soc. Japan, **36**, 169, 1968). Composition of cathode mixture, materials and assembly and characteristics of test cell. Though the internal resistance increases gradually as discharge proceeds, this system can be used as single shot battery in emergency flares, air-sea rescue equipment and direction finding equipment etc. One table, 9 figures and 2 references.

5. Preparations and physical properties of porous carbon electrodes—

G. Kano, K. Horita and Y. Kogauchi (J. Electrochem. Soc. Japan, **36**, 174, 1968). Determination of the physical properties of porous carbon electrodes baked under various conditions of fuel cells, air cells, etc. Six tables, 10 figures and 5 references.

6. The lead-acid accumulator-X—

R. S. Mani (Accumulator, **3**, No. 4, 9, 1968). Detailed description of the battery generator and regulator; 3 figures.

7. Some aspects of indigenous development of a pocket typed sealed nickel cadmium cell—

P. K. Saha (Electro Technology, **12**, 151 1968). It is concluded that these types of cells could meet the defense services requirements for communication equipments. Two tables, 2 figures and 3 references.

8. Metals: key to battery-powered auto—

D. V. Ragone (Materials Engg., **68**, No. 4, 34, 1968). This article reviews the pros and cons of various material systems used in commercial batteries and takes a look at advanced systems with potential for use in electric vehicles.

9. Fuel cells: their status and future outlook—

E. Yeager (Chem. Engg. Progress, **64**, No. 9, 92, 1968). Introduction; hydrogen-oxygen, hydrazine-oxygen, hydrocarbon consuming and sodium amalgam-oxygen cells; 2 tables, illustration and 42 references.

10. Anodic protection for the control of corrosion fatigue—

W. E. Cowley, F. P. A. Robinson and J. E. Kerrich (British Corrosion J., **3**, 223, 1968). Potentiostatic anodic polarization studies on two carbon steels and three stainless steels in oxidizing media have led to the conditions necessary for anodic protection. Fatigue tests were carried out. Fifteen tables, 17 figures and 22 references.

11. Pitting corrosion in copper tubes—cause of corrosion and counter-measures—

E. Mattsson and A. M. Fredriksson (British

Corrosion J., **3**, 246, 1968). Report on 15 cases, 6 tables, 12 figures and 12 references.

12. Passivation of crevices during anodic protection—

W. D. France and N. D. Greene (Corrosion, **24**, 247, 1968). The ability to passivate crevices during anodic production is controlled by electrolyte characteristics, crevice geometry and electrochemical behaviour of the protected metal; 2 tables, 5 figures and 14 references.

13. Atmospheric corrosion of metals, Part 2—

Th. Warner and H. Laub (Anti-Corrosion Methods and Materials, **15**. No. 10, 12, 1968). Measures for their protection with special reference to zinc and cadmium electrolytic coatings on steels; 7 references.

14. Investigation into the problem of atmospheric corrosion fatigue—

(Anti-Corrosion Methods and Materials, **15**, No. 10, 16, 1968). Corrosion fatigue of structural metals, fatigue cracks; illustrations.

15. New corrosion-resistant high temperature heat exchanger materials—

D. R. Holmes (Corrosion Science, **8**, 603-622, 1968). Examination of the material properties required to provide an economic increase in the efficiency of electrical power generation by increasing steam temperatures from 560-600°C. Considerations of cost, strength and corrosion resistance, and possible directions for research and development. It is concluded that none of the currently available materials is suitable. Composite and coated alloys and non-metallics are discussed; he former offer the most immediate prospec- for advances. One table, 7 figures and 75 references.

16. Relationship between metallic corrosion and limiting current using the rotating disk method—

Z. Zembura (Corrosion Science, **8**, 703, 1968). Applications of the method in the investigations on metallic corrosion, and experimental illustration; 9 figures and 15 references.

7. Controlling corrosion by process design—

G. Sorell (Chem. Eng., **75**, No. 16, 162, 1968). Seven proven areas of process design where chemical engineering techniques are often more effective than materials selection and fabrication in controlling corrosion: neutralization, dehydration, decoration, desulfurization, reagnt selection temperature control and, transient and downtime conditions. Tables, illustrations and 8 references.

18. Critical potentials in corrosion chemistry and their measurement—

W. Schwek (Werkstoffe u. Korrosion, **19**. 741, 1958), The corrosion behaviour of a given system can be evaluated on the basis of the border lines between the different zones of the metal behaviour: thermodynamic stability of the metal, active and transpassive corrosion, surface layer passivity, chemical passivity, etc. Under certain conditions local corrosion may appear within certain potential regions, and the border potentials of these regions are discussed with particular attention to measurement probelms involved. With corrosion protection by cathodic or anodic polarization the border potentials have the meaning of protection potentials.

19. Corrosion testing by current density potential measurement in liuqid media—

E. Heitz (Werkstoffe u. Korrosion, **19**, 773, 1968). Methods for determination of corrosion rate, examples with limitations, problems encounted in practice.

20. The electrochemical behaviour of some nickel base and cobalt base alloys—

R. B. Leonard (Corrosion, **24**, 301, 1968). Potentiostatic anodic polarization curves are provided for Hastelloy Alloys B, C, D, F and G. Haynes Alloy No. 25, and Haynes Stellite Alloy No. 6B in a variety of media. The data can be helpful to the engineer for qualitatively determining how a metal will behave in a given environment when specific weight loss corrosion data are not available. Three tables, 14 figures and 15 references.

21. Lead as an anode—Part 1—

J. A. von Fraunhofer (Anti-Corrosion Methods and Materials, **15**, No. 11, 9, 1968). The anodic behaviour of lead in sulphuric acid, formation and properties of lead peroxide corrosion behaviour of lead in sulphuric acid. One table and 7 figures.

22. Precautionary measures against the formation of white rust on galvanised products

R. Haarman (Ind. Anz. Germany, **90**, 720,

1968); Zinc Abstracts, **26,** 312, 1968. The formation of wet storage stain on galvanized surfaces is discussed. Methods for prevention of stain during transportation or storage are described. The use of protective coatings is considered and the correct storage techniques are indicated. One table, 2 illustrations and 3 figures; in German.

23. Corrosion test on condenser tubes by model condenser at Meiko power station (Rep. 4)—

S. Sato (Sumitomo Light Met. Tech. Rep., **9,** 76-90, 1968); Copper Abstracts No. 8180 in Copper, **2,** No. 6, 27, 1968. Report of the final inspection of 420 copper alloy condenser tubes tested for corrosion resistance in Japan. It was observed that the corrosion was caused by typical polluted seawater. The alloys used were copper with aluminium, tin, tin-zinc, zinc-aluminium, nickel-iron and tin-aluminium. An alloy containing tin 6-10 and aluminium 1-2 per cent, with or without small amounts of silicon, showed the best corrosion resistance.

24. Sea water for industry creates special problems—

J. Wagner (Chem. Engg. Progress, **64,** No. 10, 59, 1968). Corrosion properties of materials determine permissible limits of operation for industrial equipment cooled by sea water. This has been discussed in detail with reference to problems, sea water, corrosion, bimetal corrosion cells, local corrosion cell, metal behaviour, corrosion control and velocity control; 9 figures and 3 references.

25. The analysis of corrosion products—

D. R. Grant and G. R. Wallwork (Australasian Corrosion Engg., **12,** No. 11, 9, 1968). Chemical and physical analytical methods, electron beam microprobe analysis; 16 references.

26. Corrosion problems in dentistry—

A. A. Grant (Australasian Corrosion Engineering, **12,** No. 9, 11, 1968). Introduction, sterilization and disinfection, mouth environment, dissimilar metals, dental amalgam, conclusion; 6 figures and 26 references.

27. Anodic oxidation of ethanol and its beta-substituents at smooth platinum electrode—

S. Takahashi and Y. Miyake (J. Electrochem. Soc. Japan, **36,** 181, 1968). The results with the linear potential sweep technique suggest that the difference in the oxidation rate of each reactant might be due to the difference in the strength of chemisorption of each reactant or species formed from it to the electrode; 5 figures and 5 references.

28. Anodic oxidation of organic compounds—

S. D. Ross (Trans. New York Acad. Sci., Sr. II, **30,** 901, 1968). Highlights of the progress made and the problems faced in this field; 17 references.

29. Molten salt descaling baths—

R. H. Shoemaker (Metal Finishing, **66,** No. 10, 60, 1968). An account of 5 basic types of baths: high-temperature, intermediate-temperature and low-temperature oxidising; reducing; and electrolytic-oxidizing; reducing; 2 tables.

30. The role of metals—

J. Crowther (Metals and Materials, **2,** 294, 1968). A contribution to the Institution of Metallurgists, London Spring Course: Metals, plastics, ceramics—competition or complementation. Properties, competition and co-operation; 2 tables and 7 figures.

31. Cutting-tool materials—

E. M. Treat (Metallurgical Reviews, **13,** No. 127, 129-144, 1968). Review with 5 tables, 8 figures and 166 references.

32. Zinc-rich systems-slelection and application—

G. L. Gillies (Australasian Corrosion Engineering **12,** No. 10, 11, 1968). Introduction, classes of zinc-rich paint, surface protection, costs; 2 tables, cost data and 4 references.

33. Welding aluminium—

(Australasian Corrosion Engineering, **12,** No. 10, 17, 1968). Resistance to corrosion of welded assemblies; inspection, testing and quality control; penetrant testing; magnetic and eddy current testing.

34. Some developments in aluminium chemistry —

K. Wade (Chemistry in Britain, **4.** 503, 1968). Survey of recent structual work in aluminium chemistry; 2 tables, 1 figure and 58 references.

35. Feasibility study for the manufacture of electrolytic manganese metal in India—

N. M. Singh and D. N. Dey (Chem. Age of ndia, **19**, 1170, 1968). It is found to be desirable to set up a production unit of 3 tonnes per day of electrolytic manganese at a location where cheap power is available. Five tables, 3 figures and 11 references.

36. Progress of physical metallurgy in Czechoslovakia—

P. Rys (Metals and Materials. **2**, 332, 1968). Introduction; trends and principal results-fatigue, brittle fracture, creep, structure and properties of martensite, substitutional solid solutions; heat-and corrosion-resisting steels-chromium and austenitic. Two tables, 5 figures and 91 references.

37. The heat-treatment of low-alloy steels—

W. E. Duckworth (Mettalurgical Reviews, **13**, No. 128, 145-170, 1968). Review with 3 tables, 48 figures and 133 references.

38. The abulities of terne plate—

J. B. Long (Tin and Its Uses, No. 79, 5, 1968). Brief account with reference to solderability, weldability, non-corrodibility, paintability, durability and building construction.

39. U.S. Zinc industry—1967—

J. L. Kimberley (Zinc Inst. Inc., 1968, 19 pages); Zinc Abstracts, **26**, 323. 1968. Annual review: consumption, market, research and development work.

40. Preparation and anodic properties of lead alloyed with non-miscible metals—

V. N. Bryntseva, Y. D. Dunaev and I. I. Mitin (Izv. Akad. Nauk Kaz. S. S. R., Ser. Khim., U.S.S.R., No. 4, 27 (1967); Lead Abstracts, **8**, 171, 1968. An ultrasonic method is given for introducing into lead the non-miscible metals cobalt, tungsten, molybdenum and zirconium. During electrolysis in sulphuric acid solution with the lead anodes, the lead potential is lowered by about 40 millivolts by additions of cobalt and tungsten, cobalt being most effective in reducing attack on the lead. Tugsten and zirconium reduce the attack by a factor of two, while molybdenum only exhibits a temporary protective action.

41. The platinum group metals——

J. E. Philpott (EM & D, **11**, 1605, 1968). These metals provide the designer and engineer with a range of materials possessing a unique combination of properties which make them suitable for applications that demand the utmost reliability. These aspects have been discussed in details; with 3 figures and 9 tables.

42. A new high-damping manganese copper alloy—

J. M. Langham (Copper, 2, No. 5, 6, 1968) The first large casting in the new alloy, "Sonoston ", was a propeller requiring a two-ton melt. The soundness of the casting, damping capacity measurements, together with mechanical, corrosion and fatigue tests were all highly encouraging. The optimum composition is an alloy containing copper 37, aluminum 4.25, iron 3 and nickel 1.5 per cent. Here is a detailed account under: introduction, properties, production characteristics and applications; illustrations and 3 tables.

43. Copper inside and out—

(Copper, 2, No. 6, 10, 1968). A new concept of the further exploitation of the copper-metals for both the styling and certain technical aspects in modern automobile design.

44. Relying on reliability. Copper's role in the aerospace industry—

(Copper, **2**, No. 6, 12, 1968). Applications of the copper-metals in the aerospace industry are not immediately apparent, but this review with illustrations highlights some of the many hidden contributions which these metals make to safely in air travel.

45. Cupro-nickel alloys: their properties and most important applications—

A Faust (Symp. on cupro-nickel alloys, Breda, May 1968, 16 pages); Copper Abstracts No. 8171 in Copper, **2**, No. 6, 26, 1968. Reviews alloys with 55 per cent or more copper and remainder nickel, with small additions of iron and manganese to increase corrosion resistance. Applications include marine service for piping and heat exchangers, and for coinage, electrical resistance elements and bimetals in thermocouples Corrosion resistance is dealt with in detail: excellent resistance to sewater, unlikely to be prone to pitting corrosion or erosion, and will not be affected by polluted estuarine waters.

46. The use of titanium in the chemical industry—

L. H. Keys (Australasian Corrosion Engg., **12**, No. 11, 5, 1968). Introduction, corrosion

behaviour, applications; 3 tables and references 6 plus 2.

47. Brazing aluminium—

(Australasian Corrosion Engg. **21,** No. 11, 27, 1968). Materials used, fluxes, cleaning and finishing, design and preparation of joints, cleaning,t orch brazing, furnace and dip brazing.

48. Materals of construction—

A. P. Goel (Chem. Age of India, **20,** 73, 1969). Factors in selection of materials have been discussed with particular reference to naphtha steam reformation; tables, 13 figures and 6 references.

49. Direct explosive compaction of powder materials.—

R. W. Leonard (Battelle Tech. Review, **17,** No. 10, 13, 1968). Compaction of metallic and nonmetallic components from powders is useful in high-temperature work, and compaction with explosives produces the extremely high pressures required for full densification. This article explains the technique, assesses its present development and predicts production usage when more knowledge is gained about its mechanics. Three tables, 4 figures and 5 references.

50. Materials of construction—Metallic—

(Equipment '68, issued with British Chem. Engg., Nov. 1968, 105). Newer metallic materials of construction for processing equipment under service conditions: physical metallurgy provides new alloys, ferritic-perlitic and feritic steels. nickel-chromium alloys, cobalt-based alloys, high-temperature strength alloys, nickel molybdenum alloys, titanium, zirconium, palladium; tables and 7 figures.

51. Dielectric relaxation and molecular behaviour—

M. Davies (Sci. Progress, **56,** 337-356, 1968). Introduction, some of the principal features in gases, liquids, solutions, solids; 6 tables, 2 figures and 52 references.

52. Improved data recording for automatic potentiodynamic polarization measurements

W. D. France and R. W. Lietz (Corrosion, **-4,** 298, 1968). Improvements in instrumentation for automatically plotting potetiodynamipolarization curves by using a scanning potonc tiostat, a logarithmic converter, and an X-Y recorder are described. One table, 6 figures and 5 references.

53. Some problems of the electrical double layer—

R. Parsons (Rev. Pure Appl. Chem., Australia, **18,** 91, 1968). Unresolved problems concerning the electrical double layer are reviewed with 162 references.

54. Chemical accelerators—

R. Wolfgang (Sci. American, **219,** No. 4, 44, 1968). The nature of chemical reactions atall energies is opened to study by these new devices. They produce beams of molecules, atoms or ions that are made to react under precisely controlled conditions. Here is a detailed account with illustrations.

55. A comparison of radiotracer and electrochemical methods for the measurement of the electrosorption of organic molecules—

E. Gileadi, L. Duic and J. O'M Bockris (Electrochim. Acta, **13,** 1915. 1968.) The electrosorption of benzene on platinized platinum has been reinvestigated by a radiotracer and 3 electrochemical methods. The results obtained by all the 4 techniques are in good agreement in certain potential and temperature ranges. Two tables, 11 figures and 34 references.

56. Stabilizing the superconductors—

A. C. Barker (Copper, **2,** No. 6, 2, 1968). Superior electrical conductivity at low temperatures is one of the basic properties of the new types of copper-stabilised superconductors which have extensive potentialities for the windings of magnets.

57. Computers in the lab: their strengths and weaknesses—

D. F. Detar (Sci. Research, **3,** No. 24. 1968). There are 2 broad tasks that a computer can be used for—collecting and processing data,and controlling instruments or experiments in a closed loop. At present the first one represents the most important push for interfacing computers with instruments already in the laboratory. These aspects are discussed in this article including type of instrument and cost.

58. The role of the chemical industry and its importance to the national economy—

M. J. C. Hutton-Wilson (Chemistry & Industry, No. 34, 1137, 1968). A detailed discussion with special reference to the U.K.; 7 tables, 5 figures and 11 references.

59. Report on the electrolytic industries for the year 1967—

J. H. Sullivan and R. R. Dukes (Electrochem. Tech., **6**, 365, 1968). Electrochemical Society, New York report: electrical energy, chlorine-caustic soda, other alkalies and electrolytic processes, developemnts of interest; tables and 46 references.

60. Electrical and photoelectric properties of organic polymeric semiconductors—

V. S. Myl'nikov (Russian Chem. Reviews, No. 1. 25, 1968). Review with 300 references.

61. Trends in process development—

F. R. Bradbury, L. M. Rose and C. W. Suckling (Chemistry in Britain, **4**, 489, 1968). Discussion of the underlying considerations and current state of the art: introduction, systems, economic dimension, market evaluation, process understanding—discovery—definition, design, construction and start-up, cost of uncertainty. Six figures and 16 references.

62. Various systems associated with production of carbon disulphide—

S. C. Naik (Chem. Age of India, **19**, 1183, 1968). Review of commercial methods; methane process has been recommended and an early possibility for higher hydrocarbon process has been indicated. Four tables and 20 references.

63. Evaluating plastics and resins—

O. H. Fenner (Chem. Engg., **75**, No. 24, 182, 1968). Modern techniques for evaluating plastics and resins permit reliable correlations between laboratory and field tests. Here is a detailed account of the methods.

64. Who owns the earth?—

B. M. Byrne (Australasian Corrosion Engineering, **12**, No. 10, 3, 1968). An examination of the serious corrosion side effects of the application of cathodic protection. Introduction, nature, identification and methods of suppressing interference, who owns the earth?—to which the best answer in the corrosion sense is "nobody in particular, but we all need to use it". Four figures.

65. The development of GDR chemical industry (Chem. Age of India, 20, No. 2, i-xxvi, 1969). Review of 20 years of progress.

—T.L.R.

(B) ELECTRODEPOSITION AND METAL FINISHING:

1. An analysis of job shop statistics—

D. Orenbuch (Metal Finishing, **66**, No. 10, 58, 1968). Examination of some of the available data concerning the metal finishing industry: contract finishing, plant size and output, supplier statistics; 2 tables.

2. Printed circuit board etch characteristics—

E. Duffek and E. Armstrong (Metal Finishing, **66**, No. 10, 63, 1968). Etching solutions, etch characteristics, conclusion; 23 figures and 7 references.

3. Studies on chromium plating from tetrachromate electrolyte—

N. V. Parthasaradhy and T. R. Subramanian (Metal Finishing, **66**, No. 10, 70, 1968). Introduction, current efficiency, corrosion, deposit distribution, advantages of this bath; 4 tables, 6 figures, 6 photos and 26 references.

4. The coating of alunimum with plastics by the fluidized—bed and electrostatic powder techniques—

A. H. Lamdrock (Metal Finishing, **66**, No. 10, 81; No. 11, 69, 1968). Conventional fluidized-bed coating, electrostatic spray coating, electrostatic fluidized-bed coating, process parameters in fluidized-bed coating; 1 table, 3 figures and 13 references. Coating powders, attributes of aluminium substrates, applications of fluidized-bed coating and its limitations, weathering studies. Three tables, 4 figures and references 24 plus 3 additional.

5. Effect of pH on structure and mechanical properties of electrodeposited iron—

E. M. Levy and R. D. MacInnis (J. Appl. Chem., **18**, 281, 1968). Results from a chloride-fluoborate plating bath. Both ultimate tensile strength and percentage elongation at fracture passed through a maximum over a narrow pH range, and this is supported by optical and electron microscopy; 5 figures and 7 references.