ABSTRACTS

(A) General

1. Energy sources for electrically powered automobiles—

W. T. Reid (Battelle Tech. Review, **14**, No. 4, 9, 1965). Introduction, energy storage, storage batteries, realities of electrical drive. battery systems for a small car, fuel cells for a small car, consideration of the future. Four tables and 6 references.

2. Cobalt phthalocyanine as a fuel cell cathode

R. Jasinski (J. Electrochem. Soc., **112**, 526, 1965). It has been possible to form an oxygen electrode with a metal chelate, cobalt phthalocyanine, as the active catalyst. The current densities sustained with hydrogen-oxygen cells were sufficiently high, 60-120 ma/cm² to be considered for application in practical fuel cell systems.

3. Corrosion Technology chart guide No. 3—

(Corrosion Technology, **12**, No. 4, 1965). Fifty non-ferrous metals and alloys—percentage compositions and typical uses.

4. Corrosion engineering: Professional aspects

(Materials Protection, **4**, No. 4, 51, 54, 58, 1965). How to make a literature search; your personal filing system for corrosion literature; consultant — management relationships in corrosion control work.

5. Effect of structural change on the inhibitor efficiencies of amido acids—

V. L. Stromberg (Materials Protection, **4**, No. 4, 60, 1965). Effect of inhibitor structural changes on some parameters important in the corrosion process has been investigated for a series of amido acids. Describes a new method for evaluating adsorption and desorption of these and other materials. Three figures, 3 tables and 4 references.

6. Studies on corrosion of metals by viscoplastic substances IV. On the inhibitive effect of phosphate compounds on the corrosion of metals by viscoplastic substances—

M. Izuyama and Y. Hayakawa (J. Electrochem. Soc., Japan, **32**, 219, 1964). Studies were made on the corrosion of aluminium in a viscoplastic medium prepared from calcium carbonate, and the inhibitive action of several phosphates. The alkali earth metal monobasic and dibasic orthophosphates possess inhibitive action, while among condensed phosphates sodium hexametaphosphate shows the same effect. Nine figures, 4 tables and 3 references.

7. Studies on thermogalvanic corrosion II. Thermogalvanic corrosion in the system Fe-H_2O —

T. Kishi and coworkers (J. Electrochem. Soc., Japan, **32**, 228, 1964). To obtain the fundamental aspects of the thermogalvanic corrosion in the system iron-water, the thermogalvanic behaviour of an iron electrode in buffer solutions of various pH values has been investigated. The thermogalvanic corrosion seems to be very small, compared with the natural corrosion, and appears to have no large effect on the overall corrosion.

8. Corrosion in transmitter cooling system—

L. E. Q. Walker (Electro-Technology, **9**, No. 1, 1, 1965). Various types of corrosion occurring in high power transmitter cooling systems are considered. It is shown that by the correct choice of metals and coolant fluids and by proper selection of inhibited antifreeze corrosion effects can be reduced to a minimum. Tables are given to assist in the choice of metals.

9. Living with corrosion —

F. Prange (Werkstoffe u. Korrosion, **16**, 368, 1965). It is shown with the aid of numerous examples how 'living with corrosion' can be made tolerable with systems of the petroleum industry, and how rather simple operating measures are often sufficient to remedy or at least reduce various types of corrosion damage.

10. Corrosion control and management —

A. S. Snider (Australasian Corrosion Engineering, 9, No. 4, 23, 1965). Introduction, societies and journals on corrosion, commercial

information centres, important text and handbooks on corrosion, capital and operating expenditure, maintenance corrosion problems, corrosion measurements, test specifications, defining the function; 4 references.

11. **Current density required for cathodic protection —**

L.J.E. Sawyer and coworkers (J. Appl. Chem., **15**, 182, 1965). Laboratory investigations have been made of the dependence of current demand on cathodic potential, water speed and temperature for steel and copper cathodes. Nine figures and 5 references.

12. **The application and corrosion performance of non-electroplated metallic coatings—**

J. H. Nicholls (Corrosion Technology, **12**, No. 5, 8, 1965). Review with 12 figures and 19 references.

13. **Corrosion case histories—**

R. H. Banfield (Corrosion Technology, **12**, No. 5, 15, 1965). Problems and solutions of aggressive waters in coolers and condensers.

14. **Economic evaluation of corrosion control measures—**

C. P. Dillon (Materials Protection, **4**, No. 5, 38, 1965). Emphasizes that economic aspects of solving corrosion problems are more important than the metallurgical aspects and other corrosion data. Suggests calculations, particularly of Perpetual Cost Index, which determine the most economical measures for controlling corrosion for a given set of conditions such as expected service life of equipment, maximum production losses allowable during shutdowns, usage of inhibitors or cathodic protection etc.

15. **Corrosion and electrochemical behaviour of copper—zinc alloys. II. Anodic behaviour of copper—zinc alloys. III. Dezincification accompanying anodic polarization—**

I.K. Marshakov and V.P. Bogdanov (Russian J. Phy. Chem., No. 8, 1041, 1044, 1964).

16. **Anodic protection-theoretical considerations-**

Z. A. Foroulis (Corrosion Science, **5**, 383, 1965). Some theoretical considerations pertinent to the design of large scale anodic protection cells are discussed, and an equation is developed from electro-chemical principles which can be used for design optimization purposes. Two figures and 8 references.

17. **The practical problems facing the corrosion engineer—**

M. R. Alfred (Australasian Corrosion Engineering, **9**, No. 5.25, 1965). Material selection, construction and installation, pipelines, paint coating, buildings, specifications.

18. **Valve corrosion—**

(Materials Protection, **4**, No. 6, 28, 1965). Presents 14 case histories of valve corrosion problems, explaining what caused the failure in each case and how the problem was solved; 16 figures and references.

19. **Decorative precious metal plating—**

W. T. Lee (Metal Finishing J. **11**, 133, 1965). Introduction, plating of gold and rhodium, cleaners and activators, plating of copper and nickel applications.

20. **Electrophoretic deposition of lacquer on metal surfaces—**

H. Benninghoff (Ind. Anz, **86**, 1741, 1964); abstract in Review of Metal Literature, **22**, No. 3, M 12-16625, 1965. Lacquering of metal surfaces, including automotive steel parts and heaters by anodic precipitation of lacquer from an aqueous electrolyte. Analysis of reaction mechanism, plant applications and properties of the films such as thickness and density; 11 references.

21. **Electronically controlled zinc phosphatizing-**

(MPM—Metal Prod. Manuf, **21**, No. 12, 65, 1964); abstract in Review of Metal literature **22**, No. 3, M 12-16645, 1965. Conversion coating line under complete electronic control using sensing devices to maintain solutions at uniform concentrations. Chemicals are automatically replaced as required and only one manually performed titration daily is necessary. Phosphatizing sequence.

22. **High-speed lead-tin alloy plating process—**

A. K. Graham and H. L. Pinkerton (Plating, **52**, 309, 1965). A terne alloy (lead-tin) plating process suitable for high-speed strip plating lines has been developed using a fluoborate electrolyte with hydroquinone as an addition agent. Four tables, 6 figures and 7 references.

23. **Cathodic protection coatings—**

P. Clark (Corrosion Technology, **12**, No. 4, 19, 1965), Use of cathodic protection, types of protective coatings, effects of coatings on current required for protection.

24. **Bright chromium plating baths based on tetrachromate—**

W. Roggendorf (Electroplating and Metal Finishing, **18,** 115, 1965). Description of a tetrachromate-type chromium plating solution which, while retaining all the advantages of the Bornhauser solution, is also capable of plating fully-bright deposits. The composition is total CrO_3 200-480, free CrO_3 80-120 and H_2SO_4 0.5-1.5 g/l. The cathode efficiency is 18-22 per cent at 100-200 asf.

25. **Duplex nickel plating—**

S. Konishi (Metal Finishing, **63**, No. 4, 67, 1963). A study of stress in deposits. One table, 10 figures and 10 references.

26. **Watermaks for papermaking by electroforming —**

J. P. Young (Metal Finishing, **63.** No. 4, 79, 1965). Introduction, applying the resist, exposure and development of the photosensitive coating, electroforming the watermark design.

27. **Science for electroplaters 96. Acid cadmium baths 97. Cadmium embrittlement —**

L. Serota (Metal Finishing, 63, No. 4, 83; No; 5, 76, 1965). Fluoborate baths, sulphate baths' baking, test methods.

28. **The performance of anodized aluminium and choice of treatment method —**

E. W. Skerrey and B. A. Scott (Chemistry and Industry, 668, 1965), Introduction, chemical conversion coatings, anodizing, maintenance of anodic finishes, chemical and electrochemical behaviour of oxide films on aluminium; 30 references.

29. **Electrodeposition of chromium-molybdenum alloys —**

B. A. Shenoi and (Miss) K. S. Indira (Metal Finishing, **63,** No. 5, 56, 1965). Report of results from plating with solutions containing chromic, fluosilicic and sulphuric acids, and sodium molybdate. Self-regulating and crack-free baths, hardness.

30. **Surface properties of plastics —**

W. A. Zisman (Record of Chemical Progress, **26,** No. 1, 13-52, 1965). Review with 63 references.

31. **Starting plating—the factors involved —**

H. Silman (Electroplating and Metal Finishing, **18,** 150, 1965). Introduction, whether to plate, manual or automatic.

32. **Electroplating on Zircaloy-2 with copper—**

E. Caretta, R. Di Pietro and R. Sesini (Energia Nucleare, Italy, **11,** 505, 1964); abstract in Copper Abstracts, No. 75, 5,384, 1965. A method developed for electrolytic deposition of copper on Zircaloy-2 surfaces and subsequent heat treatment for the purpose of obtaining surface diffusion of the deposited metal are described.

33. **Nickel-chromium electrodeposited coatings: A comparison of national standards —**

S. L. Bali and B. S. Krishnamachar (ISI Bulletin, **17,** 147, 1965). Seven tables.

34. **Pretreatments for metal finishing processes Part II —**

(Metal Finishing J., **11,** 197, 1965). Mechanical pretreatment, chemical and electrolytic polishing, continuous pickling of hot rolled mild steel strip, stripping.

35. **Paint bond coatings for aluminium —**

S. Spring (Products Finishing, **29,** No. 8, 34, 1965). A survey of current commercial practice in pretreating aluminium for painting: anodizing, oxide films; chromic phosphate, chromate and phosphate coatings. Two figures, 6 tables and 6 references.

36. **Characteristization of ultrasonic energy in plating baths —**

R. G. Hickman (Plating, **52,** 407, 1965). The method of limiting currents is suggested for characterizing the agitation intensity in terms of diffusion layer thickness in ultrasonically radiated plating baths. Ten figures and 10 references.

37. **Recent developments in the application and electroplating of rhenium —**

E.K. Camp (Plating, **52,** 413, 1965). Introduction, rhenium plating, some properties of the deposit, applications. Six tables, 5 figures and 16 references.

38. **Electrodeposition of delta nickel-zinc alloy from the sulphate bath —**

K. N. Rao, M. I. A. Siddiqi and C. C. Suryanarayana (Electrochemica Acta, **10,** 557, 1965). The delta-phase of the nickel-zinc alloy system

has been electrodeposited from a sulphate bath by the use of a.c. superimposed on d.c.

39. **Industrial painting — the engineering approach —**

H. C. Holmes (Australasian Corrosian Engineering, **9**, No. 6, 17, 1965). Introduction, inorganic materials, organic coatings, figuring the cost, surface preparation, inspection methods and equipment, types of coating failures.

40. **Decorative nickel-chromium plating. A decade of progress Part I —**

O. Jones (Metal Finishing J, **11**, 223, 1965). The nickel layer, double-layer nickel, triple-layer nickel, 6 figures.

41. **A survey of methods for coating metals with titanium —**

P. T. Vincent (Materials Protection, 4, No. 6, 78, 1965). Brief review of methods attempted to deposit titanium coatings on metallic substrates. Electrodeposition by the low temperature, aqueous method or high temperature, molten salt method offers best possibilities.

42. **Advances in electron tube technology—**

G. P. Sikka (Electro-Technology, 9, No. 1, 14, 1955). A review of the trend in the development of electron tube technology during 1959 - 1963; 192 references.

43. **Aluminium and its alloys in 1964. Some aspects of research and technical progress reported —**

E. Elliott (Metallurgia, **71**, 117, 1665). Concluding article: working, joining, properties, corrosion and protection, applications, standards; references 70 to 278.

44. **The oxidation of metals and alloys —**

J. Benard (Metallurgical Reviews, **9**, 473-503, 1964). Review: introduction, adsorption, formation of thin films, formatipn of thick layers, oxidation of alloys; 72 references.

45. **The conservation of ferroalloys during steel production in electric furnaces —**

V. F. Smolyakov and E. I. Moshkevich (Metallurgist, translated from Russian, No. 7-8, 408, 1964). Brief account of Russian practice.

46. **Steelmaking—A study in progressive automation —**

(Australian Chem. Engg., **6**, No. 5, 17, 1965). Introduction, cold-roll gauge control, antomatic regulation of hot-strip, production inspection of steel tubing.

47. **Titanium and its future prospects —**

L. H. Keys (Australasian Corrosion Engineering, 9, No. 5, 9, 1965). Introduction, occurrence and production, physical metallurgy, commercial alloys, corrosion behaviour. Four tables and 8 references.

48. **Economic aspects of metal melting in non. ferrous foundries —**

(Light Metals and Metal Industry, **28**, No-325, 47, 1965). Raw materials, plant, labour, furnace selection, choice of fuel, case studies.

49. **Automatic control in effluent treatment —**

G. Mattock (Metal Finishing J, **11**, 144, 1965). Introduction, general considerations, basic theory of reaction processes and control elements, electrode characteristics in plant conditions, automatic control, removal of suspended solids, oils and greases, outfall monitoring, reuse of water, economics of chemical treatment. Twelve figures and 16 references.

50. **Recent advances in polarography in Japan—**

N. Tanaka, E. Itabashi and T. Ito (J. Electrochem. Soc., Japan **32**, 119, 1964). Introduction, classical polarography, alternating current and oscillographic polarography, chrono-potentiometry and amperometry, other modifications in methodology, other types or electrodes, polarography in non-aqueous solvents and in fused salts, applications; 179 references.

51. **The control of effluent treatment processes—**

W. G. Preston (Electroplating and Metal Finishing, **18**, 156, 193, 1965). Purity limits for effluent, importance of good effluent plant design, control-neutralization and chromate reduction; cyanide oxidation, measurement and control equipment, outfall instrumentation.

52. **A comparative study of the use of graphite and lead dioxide-coated graphite anodes in the production of sodium chlorate —**

N. Nagalingam and coworkers (Chem. Age of India, **16**, 491, 1965). The data collected during the continuous operation of the electrolytic cells are presented. Higher current efficil encies even at low chloride concentrations, improved life and absence of sludge in the cell

liquor due to the insoluble nature of the electrode material results from the use of lead dioxide coated anodes. Two tables on cel-performances and 11 references.

53. **Thermodynamics in chemical process design**

P. K. Bishnoi (Chem. Age of India, **16**, 506, 1965). Thermodynamics works as a powerful tool to avoid the searching of some fantastic possibility and belps by indicating likely occurrence in understanding research for new and interesting synthesis of products. This discusses these aspects; 9 references.

54. **Electrochemistry makes new organometals—**

(Chem. and Engg. News, **43**, No. 16, 46, 1965). Organometallic anions and radical-anions serve as electron transfer sources.

55. **Fresh water from the sea —**

E. Marcar (Copper, No. 24, 3, 1965). Introduction, water desalting processes, the place of copper metals; bibliography.

56. **Electrolytic chromatography —**

T. Fujinaga, C. Takagi and S. Okazaki (Intenational Chem. Engg., **5**, 374, 1965). Development of a new chromatographic separation method, combining the use of electrolytic deposition as an elutiou method for separation and determination of small amounts of metal ions.

—T. L. R.

(B) Electro-Organic Chemistry

ORGANIC REDUCTIONS & OXIDATIONS

1. Study of the processes of reduction and electro-reduction of organic substances on a Pd electrode. A. V. Shashkina and I. I. Kulakova, Zh. Fiz. Khim. 37, 1718-25 (1963).

The paper deals with the processes of reduction and electro-reduction of a series of organic substances on a palladinized Pd electrode in O. 1N H_2SO_4 and KOH.

2. Effect of functional groups on the process of electroreduction of unsaturated organic substances — A. V. Shashkina and I. I. Kulakova, Zh. Fiz. Khim. 37, 1726-32 (1963).

The functional groups affect the electroreduction by the electron mechanism. This has been discussed by a systematic study of the reduction of a number of organic substances on a Pd electrode in O. 1N H_2SO_4 and KOH.

3. Electrochemical oxidation of 9-arylamino anthracences in non-aqueous medium and (formation) complexes by charge transfer —Georges Cauquis, Jean Pierre Billon. Jacques Raison and Yves Thiband, Compt, Rend **257**, 2128-30 (1963).

Discusses the formation of free radical intermediate in the oxidation of 9-arylamino annthracene, which is identified by its electron para magnetic resonance spectrum.

4. Catalytic hydrogenation and electrochemical reduction of dimethyl acetylene carbinol on dispersed Pd-Ni alloys. P. A. Karpova and I. P. Tverdovskii, Tr. Gos. Inst. Prikl. Khim. No. 49, 230-3 (1962). C. A. **60**, 1153 (1964).

The effect of increasing the nickel content in the binary alloys of Pt-Ni and Pd-Ni on the catalytic hydrogenation of a solution of dimethyl acetylene carbinol is discussed.

5. Catalytic hydrogenation and electrochemical reduction of maleic acid on Pd-Pt alloys. R. A. Karpova and I. P. Tverdovskii, Tr. Gos. Inst. Prikl. Khim. No. 49, 215-23 (1962). C. A. **60**, 1155 (1964).

The catalytic properties of Pt-Pt alloys for the reduction of maleic acid is compared with their hydrogen overvoltage.

6. Mechanism of the electrochemical oxidation of formic acid in acid electrolytes — A. Kutschker and W. Vielstich, Electrochim. Acta, **8**, (12), 985 (1963).

Current-voltage plots with formic acid in acid electrolytes at noble metal electrodes show in general three anodic peaks. The first peak represents the splitting of the acidic H atom. At second and third peaks, non-specific electrochemical or chemisorbed reactions occur.

7. Comparative voltammetric study of methanol oxidation and adsorption on noble metal electrodes in $HClO_4$ solutions — M. W. Brieter, Electrochim. Acta, **8**, (12), 973 (1963).

8. Electrochemical studies of reducible aromatic compounds — Robert Edward Visco (Univ. of Illinois, Urbana), Dissertation Abstr. **24**, 489 (1963). C.A. **60**, 3714 (1964).

9. Electrochemical study of kinetics of a chemical reaction coupled between two charge transfer reactions — G. S. Alberts and Irving Shain, Anal. Chem. **35** (12), 1859 66 (1663).

The reduction of p nitrosophenol was studied by potentiometric, polarographic and