# ABSTRACTS

1. **Review of recent published information concerning new developments, applications and uses in copper and copper alloys for corrosion resistance-**

R. J. Pearson, M. J. Booth and P. N. Ibbotson (Australian Corrosion Engg. **6**, No. 1, 9, 1962). Introduction, types of corrosion, copper alloys in chemical plant; 100 references.

2. **Corrosion in the electrical power industry —**

L. L. Goodman (Corrosion Engineer, **4**, No. 1, i, 1962). Generation, transmission, cables, utilization, general.

3. **Platinum anodes. Cathodic protection applications — Part I —**

G. W. Walkiden (Corrosion Technology, **9**, 14, 1962). This review paper provides a balanced overall picture of the various applications in the field. The development advantages and limitations are described of three types of support for a thin layer of the metal, as well as an alternative use of platinum in the platinum-lead bi-electrode. At present only two types of platinum electrode can be widely recommended.

4. **Underground corrosion of metals and a loys Part II Behaviour of five Indian soils in modified Denison cell —**

K. Roy, M. Sarkar and B Chatterjee (Indian J. Appl. Chem., **24**, 113, 1961). The corrosivity of five soils collected from selected spots on the Durgapur-Calcutta route on cast iron and mild steel has been determined by using the electrolytic corrosion cell. A reasonable correlation has been observed between the combined weight losses of the anodes and cathodes and the ratio of the total anions, expressed as milliequivalents per 100 gm. of the soil to the water holding capacity of the respective soils. Very little correlation has been found between soil characteristics and weight loss of the electrodes, or between the initial cell current, maximum pitting and the combined weight losses. Three tables, 4 figures and 9 references.

5. **The electrochemistry of copper, nickel and chromium in the Corrodkote and Cass test electrolytes —**

J. V. Petrocelli, V. Hospadaruk and G. A. Dibari (Plating **49**, 50, 1962). The electrochemical behaviour of copper, nickel and chromium electrodeposits in the Corrodkote and Cass test electrolytes has been determined. Electrode potentials, cathodic and anodic polarization curves were obtained and the corrosion diagrams of the various metals constructed. Indicated galvanic effects are discussed.

6. **Conquering the outer space of corrosion science —**

H. H. Uhlig (J. Electrochem. Soc., **109**, 9c, 1962). Palladium mealddress to the Electrochemical Society under introduction, anode and cathode reactions, passivity, effect of complexing agents, unusual valence states, oxidation and tarnish, effect of stress, outlined programme of foundamental corrosion research; 42 references.

7. **The electrochemical behaviour of uranium —**

J. W. Ward and J. T. Waber (J. Electrochem. Soc., **109**, 76, 1962). The potential behaviour of uranium was studied in both oxidizing and non-oxidizing media. A low critical anodic current and a very high critical potential for passivity were observed. The active-passive corrosion behaviour is similar to that of stainless steel and titanium.

8. **Anodic polarization studies in neutra and alkaline solutions containing corrosion inhibitors 1. NaOH-NaCl System —**

K. S. Rajagopalan, K. Venu and K. Balakrishnan (J. Electrochem. Soc, **109**, 81, 1962). An elegant method of finding out at what concentration of corrosive constituents neutral and alkaline solutions become corrosive is described. It is based on anodic polarization measurements over as short a period as 5 mins and takes into account the mechanism of passivation of metal surfaces in such solutions.

9. **Influence of acriflavine and of some inorganic inhibitors on the dissolution of steel in sulphuric acid —**

C. K. Mital and I. P. Anoshchenko (Chem. Age of India, **13**, No. 1, 21. 1962). The effect of acriflavine, stannous and stannic chlorides and sodium bromide and their combinations on the dissolution of mild steel in 2N sulphuric acid has been investigated. The protective action is found to be: stannous chloride 70-9 , acriflavine 48-86, bromide 39-69 and bromide plus acriflavine or chloride greater than 97 per cent.

10. **Protection problems encountered in storing military equipment—**

O. R. Dinsmore (Materials Protection, **1**, No. 1, 66, 1962). Dynamic dehumidification has been found to be the best means of accomplishing short or long range storage of marine and rail equipment.

11. **Inhibition of the corrosion of 98. 8 per cent aluminium in hydrochloric acid solutions—**

K. G. Sheth and T. L. Rama Char (Corrosion Engineer, **4**, No. 2, v. 1962). Inhibitor efficiencies have been determined for the corrosion of 98. 8 per cent aluminium in hydrochoric acid solutions with the following inhibitors : acridine, urotropin, dextrin, nicotinic acid and thiourea. The first three are the most efficient inhibitors. Polarization studies with the last three substances show that anode polarization is low, whereas cathode polarization is considerable. The corrosion process with these inhibitors appears to be essentially under cathodic control. Four figures on inhibitor efficiencies, anode weight loss and cathode potentials, and one table on Tafel parameters; 15 references.

12. **Corrosion fundamentals—**

N. Shafer (Materials Protection, **1**, No. 2, 10, 1962). Anode and cathode indicators electroplanting, preparation of microscope slides, conclusion; bibliography.

13. **Nickel's contribution to corrosion research and prevention—**

S. M. Renof (Australian Corrosion Engg, **6**, No. 2. 9, 1962). In this paper an attempt has been made to show how nickel and its alloys have contributed to our available materials for resisting corrosion at normal and elevated temperatures; 12 references

14. **Corrosion inbitors checklist—**

M. Brooke (Chem. Engg, **69**, No. 3, 134, 1962). List of inhibitors for many metals in different environments; 98 references.

15. **Some structural effects of organic N-containing compounds on corrosion inhibition—**

N. Hackerman, R. M. Hurd and R. R. Annand (Corrosion, **18**, 37t, 1962). Results of investigations with amine inhibitors for steel in hydrochloric acid: molecular weight, relative molecular area, $pK_a$ and efficiency; polarization curves and corrosion currents; corrosion rates.

16. **Platinum in anodes. Cathodic protection applications — Part 2 —**

G. W. Walkiden (Corrosion Technology **9**, 38, 1962). This concluding section discusses applications and operation. Only two types of supported platinum electrode can be recommended at present — a platinum-palladium foil anode with a plastic mount and platinised titanium; 22 references.

17. **Aluminium corrosion and protection – 1961 —**

F. C. Porter (Corrosion Prevention and Control, **9**, No. 3, 49, 1962) Review covering foundamental research studies; stress, atmospheric and aqueous corrosion; acid and alkali attack; cathodic protection; anodizing; chemical conversion coatings; paintings; vitreous enamelling; plating; aluminium coatings; general; 181 references.

18. **Pourbaix diagrams. A firm basis for understanding corrosion —**

A. G. Guy and F. N. Rhines (Metal Treatment, **29**, No. 197, 45, 1962). The general idea of the Pourbaix diagram is presented, and then a typical derivation is carried through for the copper-water system. The extension of the diagram to include kinetic as well as equilibrium data is illustrated for the corrosion of iron. Additional applications are suggested and present limitations listed. Eight figures and 8 references.

19. **The building industry — Some problems with corrosion of non-ferrous metals. Parts 1, 2 —**

L. H. Everett (Corrosion Technology, **9**, 57, 95, 1962). A review of corrosion problems in domestic building is presented with emphasis on

the behaviour of non-ferrous metals in various environments.

20. **The investigation of failures of protective coatings on ferrous metals —**

K. A. Chandler (Corrosion Engineer, Vol. 4, No. 4, i, 1962). Introduction, corrosion of ferrous metals, protection of steel with coatings, metal coatings, practical failures of protective coatings.

21. **Cathodic protection—something old—something new —**

G. G Page (Corrosion Technology, **9,** 89, 1962). This brief historical summary states the position of the cathodic protection engineer and outlines the inherent problems of the subject. Sixtysix references.

22. **First principles of barrel finishing —**

W. P. Parry (Electroplating and Metal Finishing, **15,** No. 1, 10, 1962). Introduction types of barrel, media, water and compounds, barrelling technique.

23. **Addition agents in bright nickel plating —**

H. Brown (Electroplating and Metal Finishing, **15,** No. 1, 14, 1962). Introduction, organic sulphon-compounds, multiple bond linkages. Attention has been centered on the correlation of the structure of various classes of organic compounds which produce bright plate from weakly acidic types of nickel plating baths, especially the Watts type.

24. **Characteristics of stripping solutions in thickness testing of electrodeposited coatings. Nickel and copper over brass and chromium over nickel —**

P. B. Mathur et al (Indian J. Appl. Chem., **24,** 126, 1961). A 10 per cent potassium fluoride solution is reported as anodic stripping agent for testing the thickness of chromium over nickel base.

25. **Internal stress in electrodeposited tin-nickel alloy —**

M Clarke (Trans. Inst. Met. Finishing **38,** 186, 1961). Internal stress in a tin-nickel alloy deposit depends mainly on the temperature of the plating bath and on its chloride content. It is affected to a lesser degree by the current density. The results on plating from the all-fluoride, ammonium and Parkinson's baths have been presented. Three tables, 10 figures and 28 references.

26. **Internal stress and its measurement—**

C. Williams (Metal Finishing J, **8,** No. 85, 5, 1962) Measurement of internal stress, typical values of stress, origin of stresses in electrodeposits, conclusion ; 30 references.

27. **Electrodeposition of tungsten alloys from the pyrophosphate bath: Cobalt-tungsten—**

K. I. Vasu and T. L. Rama Char (Plating **49,** 60, 1962). Cobalt has been codeposited with tungsten from the pyrophosphate bath. The operating conditions have been established for the production of alloys in the composition range 11 to 49 per cent tungsten, the current density being 0.5 to 20 amp/dm$^2$, cathode efficiency 13 to 59 per cent, and cathode potential 0.72 to 1.16 volt. In the high current density range the deposit composition was practically constant. X-ray patterns of the deposits show the existence of the c.p.h. structure. Five tables, 11 figures and 25 references.

28. **Deposition of several platinum metals from molten cyanide electrolytes—**

R. N. Rhoda (Plating, **49,** 69, 1962). Sound, relatively thick, hydrogen-free coatings of platinum iridium and ruthenium may be obtained by this method at cathode current densities of 0.3 to 5 amp/dm$^2$ and deposition rates varying from 100 to 600 microinches per hour.

29. **Technical developments of 1961—**

N. Hall (Metal Finishing **60,** No. 1, 40, 1962) Review covering degreasing and cleaning, pickling, polishing, anodizing, treatments for deposit adhesion, metallic coatings, electroforming-metallizing - vapor coating, conversing films - corrosion prevention, testing and control, miscellaneous; 413 references.

30. **The 'nonsulphate' baths in electrodeposition of chromium—**

L. F. Spencer (Metal Finishing, **60,** No. 1, 60, 1962). Introduction, violet chromium isomers, black chromium deposits, other fluorine calalyst baths ; 5 tables and 31 references.

31. **Science for electroplaters 70. Leveling· 71. Leveling agents-Nickel—**

L. Serota (Metal Finishing, **60,** No. 1, 71; No. 2, 67 ; No. 3, 66, 1962). Introduction,

polarization, positive-negative levelling · thickness ratio ; cathode pontential.

32. **The chemical polishing of germanium—**

B. A. Irving (J. Electrochem. Soc., **109**, 120, 1962) The mode of action of the components of the polishing solution CP4- nitric, hydrofluoric and acetic acids, bromine, has been elucidated. The initiation of dissolution is dependant on the state of the germanium surface and the bromine concentration. The final etch rate is limited by the diffusion of hydrofluoric acid to the metal surface and even though the oxidizing agent, nitric acid, is in excess, the surface is free of detectable oxide.

33. **Iron electroplating from sulphate baths—**

K. K. Kapoor, Hira Lal and I. P. Anoshchenko (Chem. Age of India, **13**, No. 1, 35, 1962). The conditions have been established for the production of 0.5 mm thick iron deposits from sulphate solutions. Three figures on cathode polarization, efficiency and microhardness; 17 references.

34. **Finishes for architectural aluminium—**

R. V. Vanden Berg (Products Finishing, **26**, No. 5, 37, 1962). A survey of the many treatments and coatings that colour aluminium building materials and added to their durability.

35. **Electrodeposition of tungsten alloys from the pyrophosphate bath—**

T. L. Rama Char (Electroplating and Metal Finishing, **15**, 40, 1962). Detailed studies carried out in the author's laboratory have shown that the pyrophosphate bath can be used for the deposition of binary alloys of tungsten with nickel, cobalt and iron, and ternary alloys with nickel and iron. The optimum operating conditions have been established for each alloy. The experimental results are discussed with reference to deposit composition, cathode efficiency, cathode potential, structure of deposits, anode behaviour and mechanism of the tungsten deposition process. Two tables and 37 references.

36. **Hardness of electrodeposits—**

A. T. Vagramyan and Z. A. Solov'eva (Electroplating and Metal Finishing, **15**, 45, 1962). Survey covering the mechanical and physical properties of electrodeposits, factors affecting their control, thickness distribution, fundamental plating theory, surface active materials, alternating current and alloy plating.

37. **Chromium alloys electrodeposition —**

L. F. Spencer (Metal Finishing, **60**, No. 2, 48, 1962). Review covering alloys of chromium with iron, nickel, cobalt, molybdenum, tungsten, vanadium, manganese and other metals ; ternary alloys ; 66 references.

38. **Tin-lead alloy plating of bearing linings —**

A Jogarao and B. S. R. Sastri (Plating, **49**, 168, 1962). A method is proposed for the electrodeposition of thin overlays of tin-lead alloy on bearings from the fluoborate bath.

39. **What the metals engineer should know about stress in electroplated metals—**

J. B. Kushner (Metal Progress, **81**, No. 2, 88, 1962). The harmful stresses in electrodeposited metals are minimized or eliminated by proper control of plating bath conditions.

40. **Guide to electroplated coatings —**

R. J. Fabian (Materials in Design Engg, **55**, No. 2, 95, 1962). Appearance, cost and functional properties. Tables on general characteristics and uses, engineering properties, and estimated outdoor life. Hints on how to design for better plating. Two new trends — electrodeposition of nonmetallics and cermets, and improvement in processing speed by ultrasonics.

41. Hard anodizing. Studies of the relation between anodizing conditions and the growth and properties of hard anodic oxide coatings —

P. Csokan (Electroplating and Metal Finishing **15**, 75, 1962). Decreasing the concentration of the sulphuric acid electrolyte is more valuable than lowering the temperature, making possible an increase in cell voltage and a reduction in the rate of dissolution of the coating. The properties and structure of the coatings formed have been investigated together with the effects of magnesium, silicon, zinc and titanium alloying constituents of the aluminium alloy. Existing knowledge on anodizing phenomena is reviewed and some commercial hard anodizing processes are listed and compared. Twelve figures, 1 table and 36 references.

42. **Electrodeposition of tin-zinc alloys from the pyrophosphate bath—**

T. L. Rama Char and J. Vaid (Metalloberfläche, **16,** 70, 1962). Tin has been codeposited with zinc from the pyrophosphate bath. The optimum conditions for obtaining satisfactory alloy deposits in the composition range 74-98 per cent tin are: composition of solution - tin 11.9, zinc 13.2, pyrophosphate 130.5 g/l; pH 9.2, 60°C, cathode current density 0.5-4.0 amp/sq. dm and cathode efficiency 74-92 percent. Alloys containing 19-100 per cent tin can be deposited by varying the operating conditions. The corrosion of cast alloy anodes is satisfactory. Two tables, 12 figures and 14 references.

**43. Properties and behaviour of precious-metal electrodeposits for electrical contacts—**

H. C. Angus (Trans. Inst. Metal Finishing **39,** part 1, 20, 1962). The significance of hardness, thickness, resistivity and surface-cleanliness of electrodeposits of gold, rhodium and palladium for electrical contacts is discussed and illustrated.

**44. Finishing to government specifications**

B. B. Joffe (Metal Finishing **60,** No. 3, 42, 1962). Aluminium coating - hot dip - for ferrous parts, processes for corrosion protection of magnesium alloy, protective plating for inert fuze parts, coating for magnesium and its alloys, anodic treatment for magnesium alloys, and cadmium coating - vacuum deposited.

**45. Electroplating on titanium —**

L. Domnikov (Metal Finishing **60,** No. 3, 59, 1962). Summarizes information on electroplating on titanium available in published form in the U.S.A. and in Russia; 12 references.

**46. Pyrophosphate solutions widen scope of nickel plating —**

G. FitzGerald-Lee (Ind. Finishing, **14,** No. 165, 39, 19 2) In recent years work has been carried out in various parts of the world, and particularly in India, to assess the feasibility of using pyrophosphate solutions for the deposition of nickel alloys. In this article the author outlines the research carried out with alloys of zinc, phosphorus, cobalt, copper and tungsten.

**47. Chemical methods of testing the thickness of electrodeposits —**

P. B. Mathur and A. S. Lakshmanan (Electroplating and Metal Finishing, **15,** 114, 1962). Review with 46 references.

**48. Adhesion of electrodeposits —**

A. T. Vagramyan and Z. A. Solov'eva (Electroplating and Metal Finishing, **15,** 84, 120, 1962) Survey covering: measuring adhesion, factors affecting adhesion, relation between brightness changes and adhesion, further study of the electrochemical method of investigating adhesion; 41 references.

**49. Some properties and characteristics of nickel plating —**

G. FitzGerald-Lee (Electroplating and Metal Finishing, **15,** 90, 1962). A review of recent literature under: chemical nickel deposits, surface preparation, adhesion of organic coatings, stress and porosity, corrosion behaviour, determining thickness.

**50. Depolarization kinetics as a means for the study of the nature and thickness of electroplated gold—**

H. P. Agarwal (J. Sci. and Ind. Research, **21D,** 108, 1962). Depolarization kinetic study of electroplates has been found to be suitable for determining the thickness of gold deposits. This method also helps in detecting imperfection in deposits, gives information about the allotropic variety of gold or about the type of gold ion used in the plating bath.

**51. International plating standards —**

E. A. Ollard (Industrial Finishing, **14,** No. 166, 27, 1962). Keeping in view the need for internationally acceptable criteria of quality in plating, the paper discusses type of specification, types of tests, comments on specification, grades of plating, International Nickel (Mond) labelling scheme, A.I.D. specifications, terminology, thickness, international tests and suggested action.

**52. Satin finishing process eliminates polishing —**

(Industrial Finishing, **14,** No. 166, 51, 1962). In the new Efco-Udylite Satylite nickel plating process, a satin finish is produced without mechanical operations and corrosion resistance is improved.

**53. Applications, uses and properties of electroformed metals —**

E. A. Blount (Products Finishing, **26,** No. 7, 74, 1962). A detailed report on the 1962 ASTM symposium on electroforming.

**54. Electrolytic reduction of organic compounds —**

F. D. Popp and H. P. Schultz (Chem. Reviews, **62,** No. 1, 19-41, 1962). Review; introduction,

general principles, electro-organic reductions; 386 references.

55. **Electrochemical investigations in molten salt systems: Techniques and applications—**

H. C. Gaur and B. B. Bhatia (J. Sci. and Ind. Res., **21A**, 16, 1962). Materials and methods, reference systems, controlled potential and controlled current electrolyses; 152 references.

56. **Stainless steel in the chemical industry—**

(Corrosion Prevention and Control, **9**, No. 2, 25, 1962). The various types of stainless steel are discussed with particular reference to their corrosion resistant properties.

57. **The electrolytic generation of hydrogen for corrosion experiments—**

T.C. Downie and C W. Goulding (Metallurgia, **65**, No. 387, 48, 1962). The apparatus described is capable of producing a slow but continuous supply of hydrogen for several weeks. Sodium hydroxide solution is electrolysed in an H-tube cell with an iron anode and a nickel cathode.

58. **Energy sources of the future—**

J. B. Clampett and J. R. Norman (Australian Chem. Eng, **3**, 19,1962). Review under solar energy — photo-synthesis, natural temperature differences, process energy from a concentration difference, vortex tube, fuel cells, high energy batteries, generators—thermoelectric, thermionic and magnetohydrodynamic,unconventional power sources; 22 references.

59. **Unique electrolytic cell cuts chlorine costs—**

(Chemical Engg, **69**, No. 6, 1962). Using a molten lead cathode, this unit decomposes alkali salts to form chlorine and metal vapours. The latter may be condensed as pure metal or converted into a variety of products. Flow sheet and cost data.

60. **Electrolytic refining of titanium in alkali bromide bath—**

P. Ehrlich, W. Gutsche and H. Kuhnel (Z. Anorg. Allgem. Chem., **312**, 71, 1961). Electrolytic precipitation of pure titanium dendrites on iron cathodes in refining at 720-800 C, using titanium scrap as soluble anodes and electrolytes of fused potassium and sodium bromides.

61. **Recent advances in non-aqueous titrimetry by instrumental methods, 1. Conductometric and high-frequency titriuetry—**

J. T. Stock and W. C. Purdy (Laboratory Practice, **11**, No. 1, 21, 1962). Conductometric titration, high-frequency titrimetry; 5 figures and 31 references.

62. **Polarization capacitance determinations of surface roughness—**

M. R. Turpin and M. K. Testerman (J. Electrochem. Soc., **109**, 168, 1962). The results indicate that this method offers a reliable and comparatively simple method of obtaining relative roughness factors for metallic surfaces like copper, stainless steel, aluminium and titanium.

— T.L.R.