# ABSTRACTS

## (A) General

**1. Development of improved zinc batteries for high temperature storage.**

G. H. Schroeder (U.S. Govt. Res. Develop. Repts. 68, No. 1, AD 661 306, 1968); Zinc Abstracts, 26, 220, 1968. Investigations were carried out on the improvement of the high temperature storage characteristics of cylindrical zinc/manganese dioxide Leclanche cells. The causes of breakdown at high temperature and the remedial measures studied are considered.

**2. Silicon solar cells and their terrestial applications—**

S. C. Jain, H. K. Sehgal and R. B. Gangadher (J. Sci. & Ind. Research, 27, 295, 1968). Review, 6 tables, 24 figures and 29 references.

**3. Study of the effect of temperature and depth of discharge on the performance and cycle life of hermetically sealed nickel cadmium cells—**

P. G. Garratt and S. E. A. Pomroy (RAE Tech. Rept. No. 67026, 25 pages, February 1967); Zinc Abstracts, 26, 252, 1968. Performance studies of hermetically sealed nickel cadmium cells were designed to simulate orbital conditions encountered in near-earth satellites. There is a marked fall in the performance when the cells are cycled at elevated temperatures with deep discharges. Recommendations are made concerning temperature and depth of discharge for different life times of the cells. Two tables and 12 figures.

**4. Study of the voltaic and photo properties of the lead oxide solid electrolyte cell—**

J. R. Houston (ILZRO Res. Final Rept. Proj. LE-98, 61 pages, October 1967); Lead Abstracts, 8, 140, 1968. The cell investigated consisted of a thin layer of tetragonal lead monoxide formed on a lead substrate by anodization, and a metal electrode attached to the oxide surface. It is shown that the short circuit current and the back conductance increase linerarly with illumination. A concept of the "effective area" of the lead oxide cell is developed and a "ourrent generator" effect is identified. A model for the mechanism of the cell, explaining the rectification, e.m.f. and the photo-effects is proposed and experimental evidence for its validity is provided.

**5. Lead-acid traction batteries—**

(International Standard IEC Recommendation 254, 15 pages, 1967); Lead Abstracts, 8, 140, 1968. This recommendation applies to lead-acid traction batteries intended for installation in electric traction vehicles or mechanical handling equipment: main characteristics and testing methods.

**6. Energy conversion devices—**

B. H. Hamilton and T. J. Plevyak (Bell Lab. Rec., 46, No. 1, 17, 1968); Electro-Technology, abstract 350, August 1968. Different methods of direct energy conversion are described : thermoelectric generators, solar cells, fuel cells, thermionic diode and magnetohydrodynamic generator.

**7. Fuel cells and batteries get together—**

R. Brown (New Scientist, 40, No. 617, 16, 1968). Both fuel cells and storage batteries have limitations in performace, which could be mutually overcome by combining them together, to meet the needs of military field electronics and rail transport. Here is a discussion of these aspects, with illustrations including a sodium-sulphur storage cell and a fuel-cell motorcycle running on hydrazine and air.

**8. Design, fabrication and testing of vented, rechargeable silver/cadmium cells—**

S. Charlip (U.S. Govt. Res. Develop. Repts., 68, No. 7, AD 664 777, 1968). The characteristics are described of the 4 cell types constructed with rated capacities, at the 5-hour rate, of 7, 15, 22 and 31 ampere hours respectively. Test results indicate that the cells utilizing pasted positive and pressed negative electrodes should meet the functional requirements.

**9. Galvanotechnik in der elektromischen industrie—**

A. F. Bogenschutz (Galvanotechnik, 59,

34. **New copper electrowinning process will be used in Chilean plant—**

(Eng. Min. J., **168**, 88, Dec. 1967). A copper electrowinning process has been developed recently which is based on a cell of unusual design. Its construction exploits ion-exchange rates to provide controlled deposition of pure copper at the cathode. By eliminating dendritic deposition, the unit eliminates a major cause of short circuits associated with conventional electrowinning cells.

35. **The anodic oxidation of aluminium—**

A Dekker and A Middlehoek (Philips Research Reports, **23**, 342, 1968). Determination of the geometrical structure and growth mechanism of porous aluminium oxide layers and the transport number of the aluminium ions, during anodic oxidation in oxalic acid; 3 references.

36. **Bright zinc as a decorative and industrial finish—Part 2—**

M. E. Roper (Metal Finishing, J., **14**, 286, 1968). The after treatment of bright zinc deposits: improvements to the basic type, basic types evolved from the original, methods of application, conditions of operation, typical after treatment sequences; figures and bibliography.

37. **Galvanized steel—The Rolls-Royce story—**

(Metal Finishing, J., **14**, 295, 1968). Introduction, galvanized steel—why?, galvanized steel—where?, zinc plated steel, painting the silver shadow, galvanized steel—experiences and the future; 7 figures.

38. **The nickel shortage, Part 3—**

(Metal Finishing, J., **14**, 301, 1968). Concluding part of abstracts and discussion on papers presented at the IMF one-day symposium London, March 1968.

39. **Coated steel sheet as cladding material—**

J. Lasbleis (Arts Mannf., France, **182**, 32, Jan. 1968); Zinc Abstracts, **26**, 285, 1968). Hot dip galvanizing and electroplating are discussed with particular reference to production of cladding sheets for buildings. Performances and lifetimes of 380 g/m² double face coatings in rural, marine and aggressive industrial atmospheres are tabulated. Economics and other aspects are considered, and examples of savings in building time by use of the coated sheeting are cited.

40. **Bibliography of electro-organic reactions in Chemical Abstracts 61 (1964)—**

S. Swann Jr. (Electrochem. Tech., **6**, 261 1968). General, Kolbe synthesis and related subjects, oxidations, substitutions and formation of organometallic compounds, reductions, electro-catalytic hydrogenation—miscellaneous reactions and studies of several reactions.

41. **Electrochemical oxidation of organic compounds—**

N. L. Weinberg and H. R. Weinberg (Chem. Reviews, **68**, 449-523, 1968). Review: Introduction, general principles, oxidation reactions; 896 references.

42. **Recent heat treatment furnace installations**

(Metallurgia, **77**, 243, 1968). Annual survey of developments; 40 figures.

43. **The surface tension of liquid metals and alloys—**

D. W.G. White (Metallurgical Reviews, **13**, No. 124, 73-96, 1968). Review with 1 table, 20 figures and 172 references.

44. **The general physical properties of manganese metal—**

G. T. Meaden (Metallurgical Reviews, **13**, No. 125, 1968). Review: atomic properties, allotropy and transformation temperatures, liquid-state phenomena, magnetic—electrical—thermal properties, elastic, optical and other properties. Six tables, 16 figures and 126 references.

45. **The mineral resources of India—**

D. V. Ramana Rao and E. H. Hohmann (Chem. Age of India, **19**, 862, 1968). Detailed outline of the importance of mineral resources for the development of chemical and mineral dressing industries of India; tables and figures.

46. **Control of electrolyte purity in electrolytic zinc plants—**

W. Krupka and D. Krupka (Rudy Metale Niezelazne, Poland, **13**, No. 3, 137, 1968); Zinc Abstracts, **26**, 272, 1968. Methods used for controlling the purity of the zinc sulphate electrolyte solutions employed in electrolytic zinc production plants. Techniques permitting the continuous measurement of the concentrations of copper, chlorine and cadmium are considered, and the determination of the total impurity content is dealt with. The equipment used and the operating principles involved are

described. One table, 9 figures and 5 illustrations.

47. **Zinc smelter complex inaugurated—**

(Engineering, **205**, No. 5326, 746, 1968). Description of the Imperial Smelting Furnace Complex at Avonmouth, England which incorporates the world's largest blast furnace for the combined smelting of zinc and lead. The refinery produces 99.99 per cent zinc., and the lead contains small amounts of copper, silver, gold and other precious metals which are extracted. Cadmium and sulphuric acid are obtained as byproducts. An important feature of the process is the high degree of automation employed. Plant engineering and chemical engineering operations are discussed, and apparatus for the handling of zinc is described; 7 illustrations.

48. **Dry battery—**

G. R. Argue and B. Owens (EDN, **13**, No. 4, 66, 1968); Electro-Technology, abstract 348, August 1968. A dry disc-shaped electrolyte of inorganic salt and noble metal anode and carbon-based cathode, are the main features of the leakproof, wide current range, 10-year self life battery that is described. It is shown that the electrolytic conductivity between -150 and +250°C is such that the battery can meet military temperature requirements easily.

49. **Electrical methods of machining—**

B. W. Rooks (HTS Digest, **6**, No. 2, 19, 1966). Introduction, electrodischarge machining, electrochemical methods, electrolytic grinding, electrochemical formation of shapes and holes, plasma jet machining and metal cutting, miniature machining, electron beam machining, laser machining. One table, 8 figures and 4 references.

50. **Chromium-molybdenum Steel—**

A. S. Venkataraman (HTS Digest, **6**, No, 4, 31, 1966). Introduction, specification, mechanical properties, forming qualities, machining qualities, weldability, heat treatment, application.

51. **Efforts at self-reliance in the field of non-ferrous metals—**

M. B. Shankar (HTS Digest, **7**, No. 1, 15 1967). Review.

52. **Metal-containing filamentary compositions and their future—**

J. N. Fleck and coworkers (Battelle Tech. Review, **17**, No. 8, 16, 1968). Discussion of recent developments and future possibilities. Introduction, types of composites, processing technology, evaluation and utilization of composites, future of filamentary composites. Three tables, 6 figures and 8 references.

53. **The role of materials in engineering and in the economy—**

H. J. Pick (Metals and Materials, **2**, 263, 1968). Materials, processes and costs; materials, processes and design: materials in engineering and in the economy. Twentyone tables, 16 figures and 18 references.

54. **The physical metallurgy of maraging steels—**

S. Floreen (Metallurgical Reviews, **13**, No. 126, 115-128, 1968). Review with 2 tables, 12 figures and 100 references.

55. **Value engineering favours brass—**

M. S. Stamford (Copper, **2**, No. 5, 12, 1968). Three case histories are described to highlight one aspect of the advantages of using copper-metals. Illustrations and table of typical chemical compositions and mechanical properties of copper alloy forging stock and forgings.

56. **Composite materials and their application for electrical contacts—**

H. Schreiner (Z. Metallk., 58, 600, 1967). Contact materials are divided into 3 groups: metal-metal, metal-intermetallic comopunds and metal-nettaloids. Properties and applications are discussed.

57. **Development of a Co-W ferromagnetic, high-temperature structural alloy—**

R. L. Ashbrook and coworkers (Cobalt, No. 40 123, 1968). Introduction, magnetic tests, mechanical tests, metallography, conclusion. An alloy containing tungsten 7.5, iron 2.5, titanium 1, zir-conium 0.5 and carbon 0.5 has improved high-temperature stress-rupture properties above 1200°F and magnetic properties comparable to the strongest known commercially available high-temperature magnetic alloy. Two tables, 10 figures and 7 references.

58. **Making the most of beryllium—**

H. D. Hanes (Battelle Tech. Review, **17**, No. 9, 15, 1968). Introduction, commercially available forms, effect of purity on properties, thermal effects, effect of material source,

influence of fabrication history; 3 figures and 9 references.

59. **Chemical milling—**

(Wiggin Nickel Alloys, No. 91, 11, 1968). Brief description with illustrations.

60. **The first platinum refiners—**

D. McDonald (Platinum Metals Review, **12**, No. 4, 142, 1968). Historical account covering the French Goldsmiths and the arsenic process: introduction, removal of the arsenic, forging and working, new metric standards; illustrations and 10 references.

61. **A look at worldwide titanium technology—**

(Metal Progress, **94**, No. 3, 60, 1968). Report on the international conference: alloy developments, design and fabrication practices; advances in process equipment applications.

62. **Trends in the improving economic use of aluminium—**

R. T. Parker (NML Tech. J., **10**, No. 4, 51, 1968). Introduction, corrosion studies, efficient use of structural aluminium, electrical and overhead conductors, underground cable, transformer winding, welding techniques and weldable alloys, aluminium beer can, conclusion. Four tables, 8 figures and 2 references.

63. **World's largest desalination plant—**

J. P. Quayle (Copper, **2**, No. 4, 2, 1968). Description of a plant in Holland with a capacity of 6.4 million gallons per day; illustrations. Cooper metals are extensively used in their construction.

64. **Isotope dilution for weighing mercury in electrolytic chlorine cells—**

W. J. McCabe (New Zealand J. Science, **11**, 270, 1968). An isotope dilution technique using 203Hg was employed. By using a scintillation detector to measure the gamma emission it was found that 0.5 mc of 203Hg was sufficient activity to measure the 500 kg. of mercury in each cell to an accuracy of 0.5 per cent.

65. **Recent technological developments of mercury cathode electrolysis cells—**

O. de Nora (Chimica Industria, **50**, 642, 1968) Outline of recent developments.

66. **Chemical reactor design—**

Y. B. G. Varma (Chem. Age of of India, **19**, 1014, 1968). Principles of design of chemical reactors: importance, basic design stability and optimization. One table, 11 figure, bibliography and references.

67. **Electrolysed seawater plays big role in sewage disposal method—**

R. Eales (Chem. Engg., **75**, No. 13, 172, 1968). Vertical electrolytic cells, operating at 6 volts d.c., for the purification of sewage by electrolysis with seawater have platinized titanium anodes and plain steel cathodes.

68. **Effect of ultrasonics on hydrogen absorption by steel—**

L. Domnikov (Metal Finishing, **66**, No. 9, 59, 1968). Results of a study of hydrogen absorption by sheet steel in sulphuric acid after cathodic polarization in an ultrasonic field; 3 figures and 3 references.

69. **Fifty years of statistical physics—**

P. T. Landsberg (Physics Bulletin, **19**, 268, 1968). The broad effects on statistical physics of relativity and quantum theory, some other basic developments: mainly in thermodynamics and statistical mechanics. One figure and bibiliography.

70. **The scope and limitations of thermodynamics—**

K. G. Denbigh (Chemistry in Britain, **4**, 338, 1968). Introduction, processes at equilibrium, non-equlibrium states, the measure of irreversibility, non-equlibrium thermodynamics; 1 table, illustration and 6 references.

71. **Polarography of zinc in presence of glycine—**

R. Sundaresan and coworkers (Electrochim. Acta, **13**, 443, 1968). An account is given of a polarographic study of zinc in aqueous glycine medium. The electrode reaction was irreversible. The transfer-coefficient and the standard rate constant were calculated and values for the stability constants of the zinc complexes were obtained.

72. **Non-polar electrolytic capacitors—**

J. C. W. Kruishoop (Philips Tech. Rev., **29**, No. 2, 37, 1968). This new type has a large capacitance per unit volume and, in addition, there is the advantage of being connected either way round in the circuit. Practical realization of a non-polar electrolytic capacitor is discussed.

73. **Shipping containers for irradiated reactor, fuels—**

J. D. Rollins and E. C. Lusk (Battelle Tech. Review, **17**, No. 8, 9, 1968). Introduction, regulatory criteria, design requirements, role of economics in shipping container design, a look to the future. One table, 4 figures and 8 references.

74. **Lattice energies of salts and their significance in chemistry—**

A. G. Sharpe (Endeavour, **27**, 120, 1968). This article considers the factors that influence relative values of lattice energies, and shows how knowledge of these factors helps the chemist faced with such problems as how best to effect a halogen-exchange reaction, obtain a salt of a given gaseous base, or synthesize a salt of a previously unknown ion. One table, 1 figure and 7 references.

75. **Electrical conduction in thin insulating films—**

J. G. Simmons (Endeavour, **27**, 138, 1968). Introduction, the energy band picture, metal-insulator-metal system, Porle-Frenkel effect, negative resistance and memory effects in thin insulating films. One table, 14 figures and 12 references.

76. **The physics—chemistry interaction—**

G. G. Hall (Physics Bull., **19**, 297, 1968). Introduction, the situation 50 years ago, scientific instrument explosion, computer, era, theoretical revolution, quantum chemistry today-distant prospects.

77. **Electrochemical determination of the specific surface and the activity of porous platinum—**

H. Binder and coworkers (Chem.-Ing.-Tech., **40**, 586, 1968). The specific surface area of Raney platinum depends on aluminium content and decreases with use. Results were obtained from measurements of cathodic adsorption and anodic desorption of hydrogen atoms by potentiostatic sweep methods and were compared with those obstained from BET surface area measurements.

78. **Surface oxidation and reduction of platinum electrodes: coverage, kinetic and hysteresis studies—**

D. Gilroy and B.E. Conway (Canadian, J. Chem., **46**, 875, 1968). Polarization and hysteresis effects were used to study the nature and extent of surface oxidation of three sorts of platinum surface. The quality of reducible oxide depends on potential and time of anodice polarization. Galvanostatic and potential sweep techniques were compared.

79. **Colloid science: Cinderalla or fairy godmother?**

D. H. Everett (Chemistry in Britain, **4**, 390, 1968). Colloid and surface chemistry are interdisciplinary in nature. They are academic subjects, but also improve a whole range of technological porcesses. Here is an outline of the developments in the U.K.

—T.L.R.

(B) Corrosion

1. **Stainless steel resists stress corrosion cracking—**

(Metals and Materials, **2**, 185, 1968). Type 702 stainless steel containing chromium 16, nickel 2.5 and molybdenum 1 per cent has been recently developed. Corrosion resistance with 2 tables, welding and availability.

2. **The potential of the diffusion processes for metals protection—**

(Metals and Materials, **2**, 187, 1968). Metalliding principle and process, scope of the diffusion process.

3. **Control of corrosion in refinery distillation units—**

K. Reiser (J. Inst. Petroleum, **53**, 352, 1967). Internal surface electrochemical corrosion is discussed. The effects of (*a*) presence of water in the process stream, (*b*) presence of some aggressive ions such as sulphide or chloride in the water, (*c*) freely accessible surface for corrosion and (*d*) surface material susceptible to electro-chemical attack are dealt with. Typical flow diagrams are shown and distribution of corrosion and methods of control noted; 12 references.

4. **Electrochemistry of corrosion—**

R. F. Steigerwald (Corrosion, **24**, 1, 1968). Principles involved in analyzing a corrosion situation according to electrochemical methods are described. The basic formulae of reactions are given, together with an explanation of their implications and use. The commonly accepted theories of inhibition and passivation are discussed. Fifteen figures and 23 references.