# NEWS SECTION

## SECTION REPORT

### Meetings

The India Section held its second technical meeting on December 7, 1962 at the Indian Institute of Science, Bangalore when Mr. S. Venkatachalam delivered a lecture on ' The Sulphamate Bath in Electroplating'. The speaker outlined the advantages of sulphamate solutions in plating and then pointed out that the bath has established itself for the commercial electrodeposition of many metals. He then described the work carried out by him at the Indian Institute of Science on the deposition of copper, cobalt, cadmium and zinc, and of cadmium-zinc and nickel-cobalt alloys from the sulphamate bath. The experimental results were discussed with reference to the effect of the variables on electrode efficiencies, alloy composition, electrode potentials, throwing power, anode behaviour and structure of deposits. The highlights of the investigations were then pointed out. The talk was followed by a discussion, and the meeting came to a close with a vote of thanks to the lecturer.

The third technical meeting of the Section for 1962 was held on December 21, 1962 at the Indian Institute of Science. Dr. A. N. Kappanna, Director (Retd.), Central Salt and Marine. Chemicals Research Institute, Bhavnagar gave a talk on ' Marine Chemical Research '. The subject was first introduced with a brief account of the research activities of the CSMCRI in salt and marine chemicals. He then stressed that the sea could be exploited for the economical production of several valuable chemicals : potassium chloride ; magnesium sulphate, chloride and carbonate ; bromine ; rare chemicals like rubidium and caesium. He also gave statistical information covering raw materials, production, economics, cost and margin of profits etc., of the various chemicals that could be processed from sea bittern. He finally concluded that with proper planning the country is expected to become self-sufficient before long in respect of these items. The meeting terminated after a lively discussion and vote of thanks to the speaker.

The Eleventh Annual Meeting of the Section was held on Feb. 28, 1963 at the Indian Institute of Science, Bangalore. The minutes of the Business Meeting held on March 15, 1962 were confirmed. The Eleventh Annual Report covering the Section activities up to December 1962 were presented. The Officers of the Section, 1961-62, were re-elected for 1962-63.

### Personals

J. Sundararajan has left India to take up an appointment in the Dept. of Applied Chemistry, Loughborough College of Technology, England.

T.L. Rama Char has been elected as Chairman of the Bangalore Regional Centre, Indian Institute of Chemical Engineers, as well as of the Deccan Section, Royal Institute of Chemistry, London.

S. Venkatachalam has been awarded the Ph.D. degree of the Indian Institute of Science for his thesis on Electrodeposition.

### New Associates : India Section

G. Ramamoorthy, Quarter No. 6 (L-4), Road No 11, Telco New Colony, Jamshedpur.

## GENERAL NOTES

### Corrosion and the Mechanical Engineer

The mechanical engineer is dogged by corrosion and leaves a trail of corrosion wherever he goes. In boiler tubes effective results have been obtained by the installation of water softeners, and maintenance is also helped. The constant use of heat by the engineer increases chemical activity, with the result that corrosion is often serious in engines, boilers, radiators and condensers. In a small aircraft engine radiator the system is able to operate at higher temperatures by using inhibitors in a pressurized circuit. The pressurized system was first adopted by French and American car manufacturers. A method introduced into French Railways was to use TIA an inhibitor that looked after corrosion, priming and scale ; this was very successful, but the equipment would corrode when it was washed out, because a chemically clean surface was left.

Ship hull corrosion has always been a problem. Atmospheric pollution, often caused by steam from engines, has a considerable effect on the life of railway equipment. The mechanical engineer commonly encountered corrosion linked with abrasion, where no gain is achieved by using low alloy steel, for instance, in railway wagons.—BACE Journal, Vol. 1, No. 1, 6, 1962

### Molten Electrolyte Fuel Cell

A fuel cell that operates at 600—650° C may make a significant contribution to U.S. Space programme. Basically the unit consists of porous metal electrodes mounted on either side of a rigid porous magnesium monoxide disc, which is impregnated with lithium sodium carbonate electrolyte, and sealed into a mild steel body. Necessary electrical and gas leads are welded to each side of the body. Fuel gases are hydrogen, and either air or oxygen. Pure hydrogen is not essential; a cell fuelled with reformed propane gave 80—85 per cent of the power obtained with pure hydrogen. —Chem. Engg., Vol. 69, No. 20, 42, 1962.

### Metal Finishing Conference

The First International Conference of the Metal Finishing Association was held in Stratford-upon-Avon during September 1962. The technical sessions aimed at exploring the possibilities of developing (*a*) a uniform system of costing and (*b*) specifications which would be adequate for the British plater and also acceptable in any of the Common Market countries. The conference was attended by representatives from the U.K., Germany, French, Holland and Switzerland. A report on the proceedings has been covered in Electroplating and Metal Finishing, November 1962. The issue has also published the papers on 'Costing for the Out-plating Trade', and 'Standard Specifications'.

### Tri-Ni Nickel Plating

The Tri-Ni nickel plating process of the Udylite Corporation involves the use of a special nickel strike deposit between the semi-bright and bright nickel layers of a Bi-Nickel deposit. Significant improvement in corrosion resistance is obtained by this method. Details concerning the deposit, corrosion tests and operating conditions are given in Electroplating and Metal Finishing, Vol. 15, 398, 1962.

### Zinc-rich Epoxy Resin Primers in Industry

Zinc-rich epoxy paints are some of the most outstanding anti-corrosion coatings available. When combined with epoxy based top coats they will often produce an almost perfect solution to many atmospheric corrosion problems, if they are applied over perfectly prepared surfaces. The November 1962 issue of Corrosion Prevention and Control (pages i to xxiv) surveys in several papers the latest recommended procedures for this important method of protection, including details of the vitally important surface preparation stages.

### Copper and Copper Alloys

The Copper Development Association, London has released a very useful and informative publication (CDA publication No. 64, 1962, 68 pages) on Copper and Copper Alloys. It covers microstructures and equilibrium diagrams on copper and dilute copper alloys, brasses, tin bronzes and gunmetal, aluminium bronzes and other alloys. Information on the typical properties of the materials, and composition of etchants is also included. Introductory notes on the metal or alloy are first presented, and are then followed by 28 attractive slides.

### Aluminium Abstracts

The 'Light Metals Bulletin' published by the British Aluminium Co. has ceased to appear by the end of 1962. In its place the new Journal 'Aluminium Abstracts' will be issued in collaboration with CIDA, Paris.

### World's Metal Resources

It has been recently stated that all the exploitable resources of copper in the earth's crust will have been exhausted in 60 years even at present rates of production. Tin will be finished in 38 years, tungsten in 33 years, and gold in 21 years. In a century or two nearly all the resources of metals will be no more.—Metal Finishing J, Vol. 8, 380, 1962.

### The Austin Cell

Among the newer sources of electrical power under study is the Austin Cell, a thermally-activated device for generating current. It is based upon a discovery of Austin that a one-volt difference in potential exists between dissimilar metal electrodes separated by porcelain enamel heated to 250 C. Researches at the Battelle Memorial Institute indicate that the cell is of the galvanic type with an output voltage dependent on the electrode materials used. Iron anode cells appear to operate best in the temperature range 500 - 700 C. The amount of metals

gram of aluminium is needed to produce one watt-hour. Like conventional batteries, Austin Cells can be combined to provide increased output; they can also be made very light in weight. In short these cells can be designed to meet diverse requirements and uses. — Battelle Technical Review, Vol. 11, No. 11, 13, 1962.

### Corrosion Research in Germany

The German Chemical Society has been active in establishing a research programme for the group study of corrosion under the sponsorship of the German Federal Ministry of Economics. The reports from the first group of 22 projects are to be compiled in a special issue of "Korrosion". A list of 21 additional studies which are now in progress is given in the November 1962 issue of "Materials Protection".

### Films on Corrosion

Materials Protection, in its November 1962 number, gives a list of 21 films dealing with various aspects of the corrosion control and materials protection fields. Each list is quite informative, giving the running time, matter presented and source of protection.

### Seminar on Basic Chemical and Allied Industries

The first UN-ECAFE Seminar on Basic Chemical and Allied Industries in Asia and the Far East was held at Bangkok, Thailand during October 1962. The Chemical Age of India (Vol. 14, No. 6, 433-552, 1962) has brought out a special issue covering a report on the Seminar: introduction, present state of chemical industries techniques of programing development, development of salt, soda and sulphuric acid industries, development policy, manufacture of chemical plant and equipment, and international and regional cooperation in the development of the industries.

### Nickel-Cadmium Batteries in Flashlights

The U. S. Naval Radiological Defence Laboratory has, in its report US NRDL-TR-540 of 1961, presented the results of investigations on the feasibility of replacing the standard carbon-zinc expendable cell used in portable military battery-operated instruments by one of rechargeable type. Several sizes of nickel-cadmium rechargeable cell, ranging from the standard flashlight size down to button cells, 0.5 in. diameter x 0.25 in., were found to be generally satisfactory provided that the instrument would still operate reliably with the slightly

cells. Several methods of recharging these cell are discussed, including one involving the use c a solar battery recharger. Typical chargin circuits are presented, with schematics an details given of a universal charger which wi recharge the cells from any voltage, A. C. an D. C., in the range 12-110 volts.—The Nicke Bulletin, Vol. 35, No. 10, 220, 1962.

### Corrosion Prevention in Railway Electr fication

Many of the busiest routes on British Railway have recently been electrified with modern over head system operating on 25,000 volts A. C. 50 cycles. Corrosion can be a problem her because many sections of track pass throug industrial areas where the atmosphere is polli ted. Also, all the lines still carry a proportic of steam and diesel traffic which exposes tl overhead gear to locomotive blast and dies exhaust fumes. To withstand corrosion tl British Insulated Callender's Cables Grou specify a nickel-containing gunmetal of tl composition — nickel and tin each 4.5-5.5, zir 2. 5-3.5 and balance copper, for insulator cap on the live side of the system. Service exper ence has been excellent and proves economica Inco-Mond Nickel, No. 3, 11, 1962.

### Anodized Finish for Zinc

The American Zinc Institute is planning t license an anodized finish for zinc surface The process was originally developed by cor solidated Mining and Smelting Co. of Canad The anodic coating is hard with fritted struc ture composed of zinc ammonium phosphate an zinc chromate. It is formed by electrolysis of near neutral solution of ammonium fluorid either with D.C. or 60-cycles A. C. A continu ous coating is possible even in deeply recesse cavities. The finish gives added abrasion an corrosion resistance, and is a good base for pain Colours additional to the present grey-green ar being developed.—Zinc Abstracts, Vol. 20. 26 1962.

### Barrel Processes in Metal Finishing

A one-day Symposium on Barrel Processes i Metal Finishing was held by the London Branc of the Institute of Metal Finishing in Novembe 1962. The following papers were presented (1) Barrel Plating in the Semi-Conducto Industry, (2) Construction of Plating Barrels (3) Practical Aspects of Barrel Plating, (4) Bar rel Polishing and (5) Chemical Treatments i

the papers have been reported in Metal Finishing Journal, January 1963.

### Continuously-Coated Aluminized Steel

Coated Metals Ltd, London announce that hot-dip aluminized steel sheet can be supplied from a new continuous plant. The new product possesses better ductility and adhesion of the aluminium coating. It is also possible to reduce the thickness of the intermetallic layer between the steel and aluminium coating. The plant has an initial capacity of 6,000 tons per year and will handle coils up to 3 tons in weight, 32-48 in. width and 14-24 SWG. The material is lightly cold rolled to produce a smooth surface and can be supplied cut up into sheet to a maximum length of 12 ft.—Australasian Corrosion Engineering, Vol. 6, No. 12, 33, 1962.

### Nickel in Batteries

The November 1962 issue of the Nickel Bulletin has published detailed abstracts of the following 4 papers presented at the Third International Battery Symposium, Bournemouth, October 1962: (1) Properties of the Nickel-Scandium Hydroxide Electrode, (2) Kinetic Basis for the Operating Characteristics of Sealed Nickel-Cadmium Cells, (3) Performance and Servicing of Secondary Batteries in Modern High-Speed Aircraft, and (4) Charging of Nickel-Cadmium Batteries: Coulometric Control.

### Corrosion Products Bibliography

A Bibliography on Corrosion Products in High Temperature Water Systems has been published in the December 1962 issue of Corrosion. It contains the list of 123 references with condensed abstracts.

### Electroless Developments

One aspect of the usefulness of the electroless plating process is in the difficult problem of the plating of light alloys. Copper can be deposited on aluminium from an alkaline solution of ethylene diamine and copper sulphate. Another interesting method is nickel plating of magnesium from a hot alkaline nickel sulphate solution containing sodium hypophosphite, glycine and sodium fluoride. The fluoride, with which magnesium does not react, protects the metal from attack by nickel, and a deposition rate of 0.001 in/hr is claimed to be practicable. A further development is the production of slightly porous deposits of these metals. This enables thicker coatings of the platinum metals to be built up on copper and brass than are normally possible; thus, up to 30 micro-inches of rhodium or twice this thickness of platinum can be deposited in about 10 minutes. — Metal Finishing J, Vol. 9, 4, 1963.

### Cermet Plating

One of the most interesting in the field of cermets is the combination of chromium with zirconium boride which produces a highly erosion and oxidation resistant finish which is very suitable for the protection of such parts as the nozzles of solid and liquid motors and possibly for oil refinery equipment as the coating has good resistance to attack by sulphur. There are also electroforming applications. Usually this coating in thicknesses of 3-6 mil gives the best results when plated on refractory metals such as niobium, molybdenum, tantalum and tungsten as well as on graphite. The conventional 250 g/l chromic acid solution containing about 100 g/l zirconium boride particles is operated at 120-130 F and 25 asf after a strike at 70 asf. Of the nickel cermets, mixtures of nickel with a wide variety of non-metallics such as oxides of aluminium, zirconium and silicon, the carbides of silicon, tungsten and tungsten and titanium, graphite, talc, molybdenum disulphide and Teflon are used either for oxidation and wear resistance or for lubrication. Applications are still limited, and include gas turbine components, plug gauges, plastic moulding core pins and electric motor parts. The basis is a standard nickel plating bath operated at pH 1.5, 130-150 F and 10 asf, and coatings of solid particle contents up to 62 per cent weight have been reported.

The cermet coatings also include those with a platinum, rhodium or cobalt-tungsten base, while cermets based on copper, brass, cadmium or silver are still in the early development stages.—Electroplating and Metal Finishing, Vol. 16, 21, 1963.

### Inhibiting Corrosion of Uranium

In order to inhibit. the corrosion of uranium when its surface is exposed to air or moisture, the National Bureau of Standards in cooperation with the Atomic Energy Commission, U.S.A. has been evaluating the effectiveness of metallic coatings deposited on the uranium surface. Recent experiments indicate that coatings electrodeposited from non-aqueous media lend better protection to uranium than coatings deposited from aqueous solutions, but that only moderate adherence between the basis metal and metallic coatings can be achieved. In this connection a useful method has been found for determininig the porosity of electrodeposited coatings.

From organic baths metals like aluminium and zinc were tried, and copper, nickel and chromium in aqueous media. Vapour phase deposition was also investigated in the case of zinc. For porosity tests the plated specimen is stored for 24 hours in an evacuated vessel which has been partially refilled with hydrogen and heated to about 200 C. Any uranium exposed through a pore in the plating is attacked by hydrogen and converted into uranium hydride, a bulky black powder. The formation of the hydride at the site of the pit causes a visible blister; in extreme cells, the coating actually ruptures. This test is easy to conduct, and the presence of small amounts of oxygen, nitrogen or moisture does not effect the results.—Metal Industry, Vol. 102, 52, 1963.

### Hindalco's Expansion Scheme

The Hindustan Aluminium Corporation Ltd. has obtained the approval of the Govt. of India to expand its present smelter capacity from 20,000 to 50,000 tonnes of aluminium ingots per year. The company's smelter at Rihand went into production in May 1962. The expansion scheme, together with installation of a thermal power plant for the generation of the requisite electrical power, is expected to be completed by 1965-66. The proposed fabrication facilities, at an estimated cost of about Rs. 5 crores, would have an installed capacity of 15,000 tonnes, including 6,000 tonnes of re-draw wire rods, 7,000 tons of sheets, plates and circles, and 2,000 tonnes of extrusions. As per present schedules, these should be commissioned latest by 1964.

### Corrosion of the Delhi Pillar

A recent paper by Bardgett and Stanners in the Journal of the Iron and Steel Institute, Vol. 201, pt 1, pages 3-10, 1963, assembles information already available together with certain more recent observations associated with the longevity of the Delhi Pillar. It contains 6 figures, 3 tables and 33 references, and appendix covering estimation of corrosion in 1,600 years at Delhi from exposure test data. This review has lent support, in some measure, to many of the theories postulated for the good state of preservation of the pillar. They include theories relating to the mild climate, slag and oxide layers, ceremonial anointing, and the mass metal effect. It is felt that particular stress should be laid on the likelihood that, when iron or steel is exposed in dry, unpolluted atmospheres, its corrosion rate tends to zero as the years go by.

The sum total of the qualitative and supporting quantitative information leads to the view that although one may justly admire the skill and technology of the early Indian iron workers in producing so large a monument, there is no reason for surprise at its longevity and apparent freedom from corrosion. The composition and structure of the iron or its method of manufacture, unusual though these are compared with modern steel, can only have contributed in a minor degree to its preservation, and are in no way essential for this. The authors are confident that, given the same circumstances and environment, a pillar forged from modern tonnage steel would, after 1600 years, have been practically as well preserved,

### Electrochemistry Conference in Australia

The First Australian Conference on Electrochemistry was held in Sydney and Hobart from Feb. 13 to 15 and Feb. 18 to 20, 1963 under the joint sponsorship of the Royal Australian Chemical Institute, and the Universities of New South Wales and Tasmania. The sessions covered: solid state chemistry, themodynamics of electrolytes, electroanalytical methods, electroplating and anodizing, corrosion, theory of double layers, electrowining and electrorefining, electrode processes, molten salts, fuel cells, non-aqueous electrolytes and electrochemical processes (special). Fifty-eight papers were contributed by authors from Australia, Belgium, Bulgaria, Canada, Czechoslovakia, Egypt, Germany, India, Italy, Japan, New Zealand, South Africa, Tasmania, U.K., U.S.A. and U.S.S.R. There were 2 papers from India; (1) Potential Measurements in Molten Chlorides by H.C. Gaur and W.K. Behl, Delhi, and (2) Electrodeposition from the Sulphamate Bath by T.L. Rama Char, Bangalore. The Proceedings of the Conference will be published in book form by the middle of 1963 by Pergamon Press, Oxford.

—T.L.R.