ABSTRACTS

DEPARTMENT OF PHYSICS

27. THE DISPERSION FORMULÆ FOR SOLIDS. T. Radhakrishnan and G. N. Ramachandran, *Revue de Optique*, 1953, **65**, 32.

It is shown that the experimental data on the refraction and absorption of crystals are better explained by the Sellmeier-Drude than by the Lorentz-Lorenz dispersional formula.

28. RADIUM CONTENTS OF ROCK SPECIMENS FROM KOLAR MINES. V. S. Venkitasubramanian, *J. Sci. Industr. Res.*, 1953, **12 B**, 267.

The radium contents of 27 rock specimens from Kolar Mines have been determined by a method that combines the direct fusion technique of Evans and co-workers with the alpha particle counting technique of Curtiss and co-workers. Further improvement in the technique has been made by running the electron collection chamber in the proportional counter regime, resulting in improved signal to noise ratio and particle group resolution. The trend of results is similar to those of Smeeth and Watson.

29. INFLUENCE OF MOSAICITY ON THE BRAGG REFLEXION OF POLARISED X-RAYS. S. Ramaseshan and G. N. Ramachandran, *Acta Cryst.*, 1953, **364**, 6.

The difference in behaviour of mosaic and perfect crystals with respect to polarised X-rays is demonstrated experimentally by studying the azimuthal variations of intensity of Bragg reflexions when polarised X-rays are incident. It is suggested that this method could be used to assess the degree of perfection of crystals and the advantages of this method over the usual ones are indicated.

1. ELECTRODEPOSITION OF TIN FROM THE PYROPHOSPHATE BATH. J. Vaid and T. L. Rama Char, *Curr. Sci.*, 1952, **21**, 310.

Tin has been satisfactorily electrodeposited from a new type of bath, namely, the complex stannous pyrophosphate bath. The optimum conditions are: tin (stannous): 22–33 gm./L., total pyrophosphate: 112–168 gm./L., gelatin: 1 gm./L., dextrin: 10 gm./L., cathode: steel or copper, anode: tin, temp.: 60–80° C., pH: 8·0–9·5, c.d.: 1·1–4·4 amp./dm.^{2}, stirring, voltage: 0·4–0·8 volt, time required for plating 0·001″ at 2·2 amp./dm.^{2}: 25 mins.

2. ELECTRODEPOSITION OF CADMIUM FROM SULPHAMATE BATH. J. Mathur and T. L. Rama Char, *J. Sci. and Ind. Res.*, 1952, **11 B**, 546.

The sulphamate bath has been used for the deposition of cadmium on steel (or copper or brass). It gives good quality deposits over a wide range of operating conditions. A combination of glue, thiourea and dextrin is beneficial as an addition agent. This bath compares favourably with the commercial cyanide bath for cadmium plating.

3. ELECTRODEPOSITION OF SILVER FROM THE IODIDE BATH. T. L. Rama Char, *Symposium on Electroplating and Metal Finishing, NML, Jamshedpur*, 1952, 125.

Deposits from the complex iodide bath are white, dense and adherent on copper and the bath is comparable to the cyanide bath in respect of quality of deposit, cathode efficiency, c.d. range and throwing power.

4. ELECTRODEPOSITION OF ZINC FROM THE PYROPHOSPHATE BATH. J. Vaid and T. L. Rama Char, *J. Sci. and Ind. Res.*, 1952, **11 B**, 503.

The pyrophosphate bath can be used for electrogalvanizing. It possesses most of the advantages of the acid and cyanide baths, *i.e.*, high current efficiencies and c.d., ease of control and maintenance, bright and fine-grained deposits, low bath voltage and good throwing power.

5. ELECTRODEPOSITION OF CADMIUM-ZINC ALLOYS FROM THE SULPHAMATE BATH. J. Mathur and T. L. Rama Char, *Curr. Sci.*, 1952, **21**, 309.

Cadmium and zinc have been co-deposited on steel from the sulphamate bath. Deposits analysing 8–98% cadmium can be obtained by varying the operating conditions.

6. STUDIES ON THE ELECTROCHEMICAL PREPARATION OF SODIUM HYDROSULPHITE, PART IV. ELECTROCHEMICAL PRODUCTION OF SOLID HYDROSULPHITE. C. C. Patel and M. R. A. Rao, *Proc. Nat. Inst. Sci., India*, 1953, **19**, 211.

The electrochemical preparation of sodium hydrosulphite using a mercury cathode has been studied under various experimental conditions. As a result of this investigation, it has been found practicable to prepare solid hydrosulphite by a purely electrochemical method. Sodium chloride and sulphur dioxide are the principal raw materials employed. Chlorine is obtained as a by-product at the anode. Under optimum conditions, the current efficiencies for the production of sodium hydrosulphite and chlorine were found to be 90·6% and 91·4% respectively. For efficient production of hydrosulphite by the direct electrochemical method, it is desirable (1) to use mercury as a cathode, (2) to employ the catholyte containing 20 to 30% sodium bisulphite together with a high concentration of sodium chloride; (3) to employ sodium chloride in its saturated aqueous solution as an anolyte; (4) to pass sulphur dioxide to help the formation of bisulphite and consequently; (5) to maintain low pH in the catholyte; (6) to maintain as low a temperature as possible (5° C.) during the electrolysis; (7) to employ a current density between 2 and 3 amp./dm.^{2} at the cathode; and (8) to periodically remove the crystals of hydrosulphite from the catholyte.

7. STUDIES ON THE ELECTROCHEMICAL PREPARATION OF SODIUM HYDROSULPHITE. PART V. INVESTIGATIONS ON THE PREPARATION OF HYDROSULPHITE USING METALLIC CATHODES OTHER THAN MERCURY. C. C. Patel and M. R. A. Rao, *Proc. Natl. Inst. Sci., India*, 1953, **19**, 225.

Electrochemical preparation of sodium hydrosulphite has been carried out using non-mercury cathodes like iron, lead, nickel and zinc, and the results have been compared with those at a mercury cathode. An explanation is offered for the correlation between hydrogen over-voltage of the cathode and its efficiency in the electrochemical reduction of bisulphite to hydrosulphite.

8. STUDIES ON THE ELECTROCHEMICAL PREPARATION OF SODIUM HYDROSULPHITE. PART VI. STABILITY AND SOLUBILITY OF SODIUM HYDRO. SULPHITE IN AQUEOUS SYSTEMS AT VARIOUS TEMPERATURES. C. C. Patel and M. R. A. Rao, *Proc. Nat. Inst. Sci., India*, 1953, **19**, 231.

A new design has been given for the construction of an apparatus to determine the solubility of unstable substances in an inert atmosphere. Using this apparatus, the solubility of sodium hydrosulphite crystals has been determined (*a*) in water over the range − 2·8° to 20° C.; (*b*) in 10% and 20% aqueous sodium chloride over the range 0° to 20° C., and (*c*) in aqueous alcohol of different strengths from 0° to 70° C. Solubility studies with 60%, 70% and 85% aqueous alcohols indicate that the transition temperatures of the dihydrate to anhydrous sodium hydrosulphite are 64·3° C., 63·8° C. and 60·5° C. respectively.

9. STUDIES ON THE ELECTROCHEMICAL PREPARATION OF SODIUM HYDROSULPHITE. PART VII. STUDIES ON TRANSITION POINT OF SODIUM HYDROSULPHITE CRYSTALS. C. C. Patel, *Proc. Natl. Inst. Sci., India*, 1953, **19**, 239.

Dehydration of sodium hydrosulphite has been carried out in presence of aqueous ethyl alcohol, sodium chloride, sodium nitrate, sodium sulphate, tri-sodium phosphate and di-sodium hydrogen phosphate. The transition temperature varies considerably (52° C. to 67·7° C.) with the nature of the medium employed for dehydration. The transition temperature in the absence of foreign substances has been found to be 79·4° C., by extrapolation. Direct determination of this temperature is not practicable owing to the decomposition that sets in, during transition. Dehydration of hydrosulphite is best effected by heating the crystals at 52° C., in presence of a saturated solution of sodium chloride.

10. PRODUCTION OF FERTILIZERS BY THERMAL PROCESSING OF PHOSPHATIC MINERALS. N. Jayaraman and K. R. Krishnawami, *J. Sci. and Ind. Res.*, 1953, 12 B, 106–17.

No methods are known for the manufacture of ordinary superphosphate containing water-soluble P_2O_5, except by the addition of sulphuric acid to ground phosphate rock. Since the desired production of sulphuric acid in this country depends on the unrestricted availability of imported sulphur which is in short supply, a process which does not require the use of sulphuric acid but employs only locally available and inexpensive raw materials, is desirable. The process described has this desirable feature and consists of a thermal method employing an oil-fired rotary kiln developed for the conversion of Trichy phosphatic nodules into a fertilizer carrying about 15 per cent. of citrate soluble phosphoric acid. The fertilizer obtained has desirable physical and other keeping properties. One of the merits of this process is that the phosphatic fertilizer obtained, contains about 3 per cent. of soluble potash also, this being derived from the potash feldspar which is used as one of the fluxing materials employed in the process.

In the paper under reference, a laboratory method and a small-scale pilot-plant method of preparing the fertilizer have been described. Full details have been given of the average grades of the phosphatic nodules and of the devices employed for beneficiating the mineral to obtain concentrates suitable for this work. Phosphatic fertilizers containing "citric soluble" P_2O_5 may be considered to be equivalent to superphosphate carrying the same percentage of " water soluble " P_2O_5.

The cost of production of this fertilizer may be taken at about Rs. 150 per ton, whereas superphosphate sells at about Rs. 225–250 per ton.