

is generally found to hold good for aqueous solutions between 0° and 35° C., where $c' = 0.0163(c - 0.0174)$. In some cases, c' equals to $0.0177(c - 0.0177)$. Substituting these values in the above equation, we obtain $X_t = X_{18} [1 + c(t - 18) + 0.0177(c - 0.0177)(t - 18)^2]$. Hence the value of $X_t = 0$ when $t = -38.5^\circ$ C., i.e., the conductivity vanishes for aqueous solutions below -39° C.

Studying the temperature of zero conductance for jelly-forming salts of thorium, Prakash¹ and recently Mushran and Prakash² have determined its value for various negatively charged colloidal systems. Nine out of twelve substances studied by them attain zero conductance between -20° to -30° C.; that of dyestuffs investigated by us also fall in the same range.

Dyes*	Zero conductance temperature
Methylene Blue	.. - 22.5
Fuchsin	.. - 22.0
Aniline Blue	.. - 21.0
Indigo Carmine	.. - 22.0
Bordeaux B	.. - 22.5
Benzopurpurin	.. - 21.5
Congo Red	.. - 21.5
Aniline Brown	.. - 22.5
Methyl Orange	.. - 22.5
Dianilazurin G	.. - 23.5
Aniline Scarlet	.. - 23.0

* Each in 3 concentrations .05, .10, .20 per cent.

Water-soluble dyestuffs are the sodium or potassium salts of dye-forming acids of high molecular weight, or hydrochlorides or sulphates of a dye-base, and consist of: (a) ordinary inorganic ions of high mobility; (b) a micelle of high molecular weight and low mobility. The former's reaction to temperature will be similar to that of ordinary electrolytes, while the latter will attain zero conductance much earlier when the temperature is lowered. Another contributory factor which is significant in such cases is the association of water molecules, which increases rapidly on lowering the temperature.

Hence it follows that for solutions containing colloidal micelle, the temperature of zero conductance is higher than for ordinary electrolytes. Such would seem to be the case for soaps, dyestuffs, albuminous

substances, tannins, etc., and for inorganic colloids.

SATYA PRAKASH.

TEJ NARAIN SHIVAPURI,

The Chem. Labs.,
University of Allahabad,
August 29, 1949.

1. *Jour. Phys. Chem.*, 1933, 37, 907. 2. *Ibid.*, 1946, 50, 251.

OCCURRENCE OF D-MANNITOL IN THE EXUDATION OF *OLEA GLANDULIFERA*

A manna-like substance, an exudation from *Olea glandulifera* ("Sugar tree") in the Aiyur forest is reported to appear during draught and is considered to be caused by incisions wrought by insects. Any artificial injury to the tree failed to induce the exudation.

A sample of this pale yellow exudation, collected in 1946, was found after the removal of fibrous material (Ca 5%) to dissolve freely in hot water. It is practically free of ash, and contains only traces of gelatinous matter and reducing sugars. The aqueous solution, on concentration and chilling or by addition of absolute alcohol (3 vols.) after a clarifying treatment with charcoal, deposited pure crystals of D-mannitol, m.p. $165-6^\circ$ (identified by mixed m.p. with an authentic sample, by optical rotation before and after addition of borax and by the preparation of mannite-tribenzacetol,¹ m.p. 207°) in about 95 per cent. yield on the basis of water-soluble solids.

Dept. of Biochem.,

J. SRI RAM.

Ind. Inst. of Sci.,

P. L. NARASIMHA RAO.

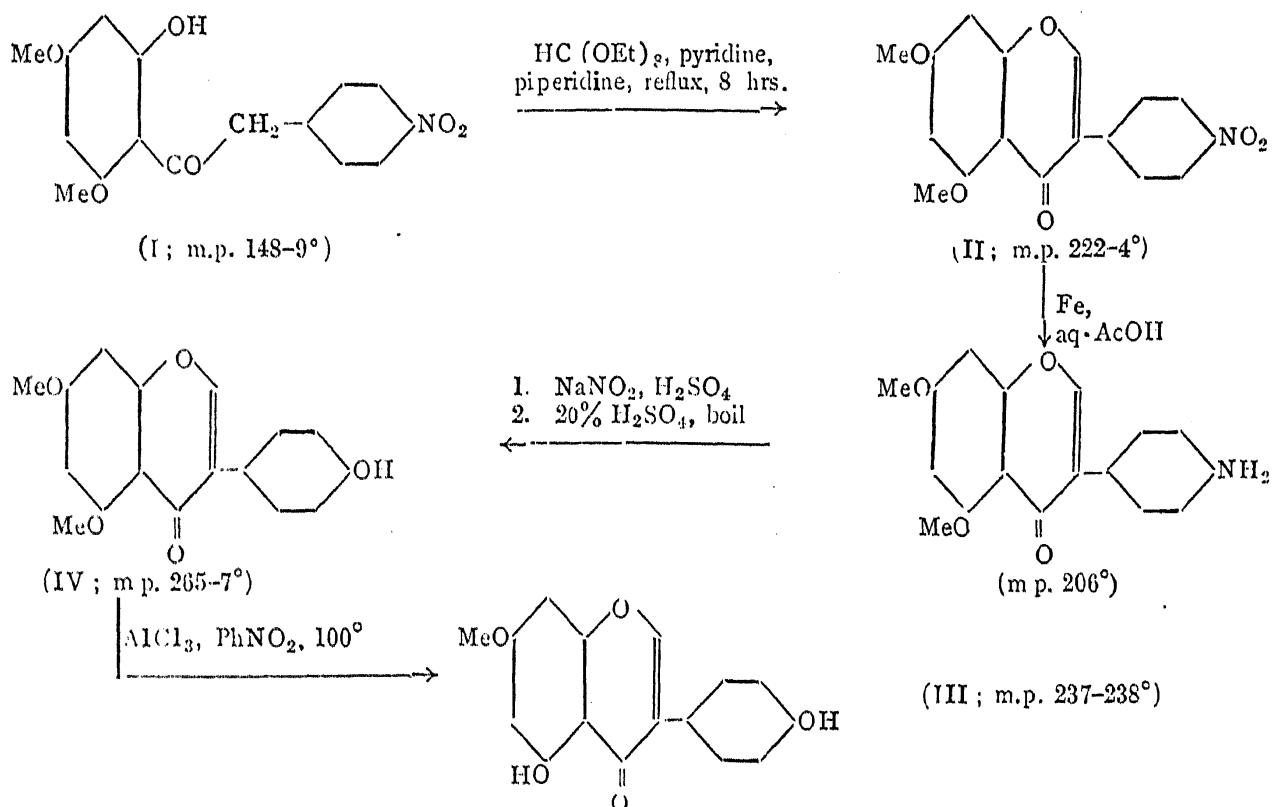
Bangalore,

October 31, 1949.

1. *Identification of Pure Organic Compounds* by S. P. Mulliken, Vol. I, p. 155.

A SYNTHESIS OF PRUNETIN

THE action of ethyl orthoformate on 2-hydroxy-4:6-dimethoxyphenyl 4-nitrobenzyl ketone (I) in boiling pyridine containing a little piperidine yields 5:7-dimethoxy-4'-nitroisoflavone (II) in 60% yield. Prunetin (III) has been synthesized from (I) by



the indicated series of reactions. Preferential demethylation of the 5-methoxyl group in (IV) can be effected by means of aluminium chloride in nitrobenzene or hydrobromic acid in acetic acid. Such partial demethylation of the 5- and 3-methoxyl groups in the flavone series, first observed by Bharadwaj¹ and Mahal,² and since used for the synthesis of several naturally occurring, partially *O*-methylated flavones and flavonols, has now proved to be of value also in the isoflavone group. The isoflavone (IV) is a suitable intermediate for santal, recently shown to be 5:3':4'-trihydroxy-7-methoxyisoflavone.³ The synthesis of santal is in progress. Using the method of Joshi and one of us,⁴ Robertson, Suckling and Whalley have synthesized santal trimethyl and triethyl ethers.³

Späth and Lederer synthesized the naturally occurring isoflavones, daidzein and pseudobaptigenin, by condensing the appropriate *o*-hydroxyphenyl benzyl ketone with ethyl formate and sodium at 100° in a sealed tube, treating the product with boiling alcoholic hydrochloric acid, and purifying the isoflavones by high vacuum sublimation.⁵ The condensation of *o*-hydroxyphenyl benzyl ketones with ethyl formate and sodium usually proceeds smoothly at 0° to yield the isoflavone in one stage; but the reaction fails with (I). While Joshi and Venkataraman protected hydroxyl groups other than the 2-hydroxyl,

Shriner and Hull have found that this is not necessary in the synthesis of 5:7-dihydroxy-4'-methoxyisoflavone (biochanin A) and 5:7:4'-trihydroxy-8-methylisoflavone (8-methylgenistein).⁶ We have observed that the reaction may be carried out without protection of the 4-hydroxyl in 2:4-dihydroxyphenyl benzyl ketone, although the 4-benzyl ether gives a better yield; but we have encountered difficulties in the preparation of 5:7-dihydroxyisoflavone directly from 2:4:6-trihydroxyphenyl benzyl ketone. However, 2-hydroxy-4:6-dimethoxyphenyl benzyl ketone (m.p. 116°) condenses readily with ethyl formate and sodium to 5:7-dimethoxyisoflavone (m.p. 120°), and demethylation with hydriodic acid gives 5:7-dihydroxyisoflavone, m.p. 193-194°; partial demethylation with hydrobromic acid in acetic anhydride gives 5-hydroxy-7-methoxyisoflavone, m.p. 139-140°.

Details will shortly appear in the *Proceedings of the Indian Academy of Sciences*.

Dept. of Chem.

R. N. IYER.

Technology,
The University,

K. H. SHAH.

Bombay,

K. VENKATARAMAN.

October 12, 1949.

1. Bharadwaj and Venkataraman, *Curr. Sci.*, 1933, 2, 50; Gulati and Venkataraman, *J.C.S.*, 1936, 267. 2. Mahal and Venkataraman, *Curr. Sci.*, 1935, 4, 311. 3. Robertson, Suckling and Whalley, *J.C.S.*, 1949, 1571. 4. Joshi and

Venkataraman, *ibid.*, 1934, 513; Mahal, Rai and Venkataraman, *ibid.*, 1120, 1769. 5. Späth and Lederer, *Ber.*, 1930, 63, 745. 6. Shriner and Hull, *J. Org. Chem.*, 1945, 10, 228, 288.

MANUFACTURE OF TAURINE

ALTHOUGH several processes exist for synthesising taurine, the method by which it could be made cheaply on a commercial scale was published recently by Goldberg¹ who reacted β -amino ethyl sulphuric acid with sodium sulphite with or without pressure to obtain a 70 per cent. yield of pure taurine. β -Amino ethyl sulphuric acid can be made in quantitative yields by sulphonation of ethanolamine after the method of Rollins and Calderwood².

The commercial process³ for the manufacture of taurine as worked by Messrs. I. G. Farben Industries, Germany, consists in the reaction of hydroxyethane sodium sulphonate with NH_3 at 200 atmosphere pressure and a temperature of 280°C . under nitrogen cushion. The hydroxy ethane sodium sulphonate is obtained by them by reacting a solution of sodium bisulphite with ethylene oxide also under inert atmosphere. These methods, as can be seen, are very difficult under present conditions in India.

The difficulty in Goldgerg's method is the separation of pure taurine from the reaction mass. The method employed is not only expensive but involves severe corrosive conditions.

This method is now modified by us with a view to making it attractive for commercial production.* β -Amino ethyl sulphuric acid (1 mol.) is boiled with sodium sulphite (1.1 mol.) for about 48 hours when the reaction is complete. The solution contains taurine together with sodium sulphate which is formed as a by-product. The boiling solution is then treated with a solution of calcium chloride (25% solution) taking care that no excess is added. Calcium sulphate which is formed settles rapidly. It is filtered and the resulting solution is concentrated to remove sodium chloride. Due to low solubility of sodium chloride, most of it is precipitated. The solution is filtered and then cooled in ice when crystal taurine crystallises, yield 80 per cent. of theory. The resulting solution contains probably di-taurine as a yellow waxy mass. Igepons as marketed by I. G. Farben Industry contains

sodium sulphate and sodium chloride as diluents.

For β -amino ethyl sulphuric acid we used a product marketed by B. F. Goodrich Co., Inc. Cleveland, Ohio, U.S.A., under the name of Goodrite β -amino ethyl sulphuric acid. It is available as white crystalline solid of 98 per cent. purity at a price ranging around 45 cents f.o.b.

The Kesar Sugar Works Ltd.,
Chemical Division, M. V. VAKILWALLA.
Goregaon, B. S. D., D. M. TRIVEDI.
August 23, 1949.

1. Goldberg, *J.C.S.*, 1943, 4. 2. Calderwood, *J.A.C.S.*, 1938, 60, 2312. 3. Hoechst, *B.I.O.S. Final Report*, 418, 9.

* Between 2000-3000 tons of Igepons are imported at present annually and used in India in the making of paper, textiles, etc.

EFFECT OF STREPTOMYCIN ON GLYCERINE VACCINE LYMPH (CALF LYMPH)

CONTRARY to the views held by some workers,^{1,2} penicillin is ineffective³ in reducing microbiological contaminants of vaccine lymph.

Preliminary sterility tests on streptomycin-treated lymphs after its removal revealed that a concentration of 5 mg. per ml of streptomycin was necessary to destroy the staphylococcus group of organisms from the vaccine lymph. The staphylococcal population, about 252 millions per ml. of vaccine lymph before treatment, was reduced to a mere 240 per ml. within 24 hours contact in cold storage (-10°C) with streptomycin in 5 mg. concentration and to 40 per ml., in another week's time. A few of the *B. subtilis* group remained unaffected by streptomycin even in higher concentrations, possibly because of their existence as spores. In combination with 500 units of penicillin, as little as 500μ gm. of streptomycin per ml., of vaccine lymph gave almost the same result Bigger,⁴ Chain & Duthie,⁵ Himmelweit⁶ and Pulaski, *et. al.*⁷ find that certain antibiotics in combination with sulphanamides, bacteriophages or antibiotics produce such a synergistic action.

The potency of vaccine lymph is unaffected both by streptomycin and penicillin in contrast to chloroform which lowers the potency.