

ions. There is a slight evidence of the formation of SO_4^{2-} ions at 200°C . as the 981 line characteristic of the SO_4^{2-} ion and the maximum at 452 attributed by Woodward and Horner to the same ion are just barely detectable in the microphotometric curves of the Raman spectra of the acid at that temperature.

P. KOTESWARAM.

Andhra University,
Waltair,
March 2, 1938.

¹ *Jap. Jour. Phys.*, 1929, 5, 119.

² *Phys. Zeit.*, 1931, 32, 212.

³ *Proc. Roy. Soc.*, (A), 1934, 144, 129.

⁴ *Ind. Jour. Phys.*, 1933, 8, 123.

Space-Group of the Stable Modification of The Crystals of *m*-Nitrobenzoic Acid.

CRYSTALS of the stable modification of *m*-nitrobenzoic acid belong to the monoclinic prismatic class. They have been examined by the rotation and oscillation method using copper K radiation. The dimensions of the unit cell are: $a = 10.41 \text{ \AA}$, $b = 10.70 \text{ \AA}$, $c = 13.22 \text{ \AA}$, $\beta = 91^\circ 12'$. This gives an axial ratio in good agreement with that obtained from crystallographic data (Groth, IV, p. 475).

Oscillation photographs were taken about the a , b and c axes at suitable small angles and a large number of planes identified. Planes ($h0l$) for which h is odd are halved and (010) is also halved. The space-group is thus C_{2h}^2 . The number of molecules per unit cell is four showing that the molecules are asymmetric. The *ortho* and the *para* compounds are under investigation.

V. C. THAKAR.

Chemical Laboratories,
Royal Institute of Science,
Bombay,
February 23, 1938.

A Method for the Determination of the Cross-section of Molecules of Soluble Amphipathic Substances.

SOLUTIONS of substances whose molecules have both the hydrophilic and the hydrophobic groups (called "amphipathic" by G. S. Hartley¹) show activated accumulation as shown by the work of the present author as well as of others.^{2,3,4,5,6} The solute

molecules accumulated at the surfaces of such solutions, show a reluctance to get back into solution. This fact can be taken advantage of, for measuring the absolute area occupied by the accumulated molecules; the details have been given in a former communication.³ It can now be shown that the accumulated molecules can be collected by sweeping with a barrier. Such sweepings are found to be more concentrated than the rest of the solution. By measuring the quantity of the sweepings and the change in concentration, the number of molecules which were present at the surface can be calculated. In a typical experiment the cross-section of benzopurpurine 10B works out to be of the order of 30×10^{-16} sq. cm. This method is capable of wide application as it can be adopted in all those cases where activated accumulation is exhibited.

K. S. GURURAJA DOSS.

Department of Chemistry,
Central College,
Bangalore, University of Mysore,
February 2, 1938.

¹ Hartley, *Aqueous Solutions of Paraffin-chain Salts*, 1936, p. 44.

² Doss, *Curr. Sci.*, 1937, 4, 405.

³ —, *Proc. Ind. Acad. Sci.*, 1936, 4, 97.

⁴ —, *Curr. Sci.*, 1937, 5, 645.

⁵ McBain and Wilson, *J. Amer. Chem. Soc.*, 1936, 58, 380.

⁶ Florence, Myers and Harkins, *Nature*, 1936, 138, 406.

Investigation on Rice.

THE question of quality in rice—the most important cereal food of India—has been receiving attention from several workers. We began our study of the problem seven years ago and attempted to correlate quality with the physico-chemical properties of rice. Part of this work has been published¹ and a paper dealing with further work will be presented before the Tenth International Congress of Chemistry at Rome. I have already stressed the view^{2,3} that rice is to be looked upon as a colloidal system intermediate between the lyogel and the xerogel. Important colloidal changes take place in the rice kernel during the later stages of the maturing of paddy. The lyogel loses water and there is a drift towards the xero state,

which is characterised by rigidity of structure. It is well known that rice from freshly harvested paddy does not cook well and is not properly digested. This is because the drift to the xero state has not advanced sufficiently. Colloid chemists are familiar with the "Wet-heat" treatment⁴ of silicic acid lyogels to produce the xero gel of proper quality. The usual "Parboiling" of paddy is to be looked upon as a means of subjecting the cereal to wet-heat. I have studied the colloidal aspect of "Wet-heat" treatment of paddy and the investigations so far carried out seem to indicate that there is an optimum temperature for the heat treatment of paddy. In the method now developed, hot air at a temperature not exceeding 70° C. is used in "Parboiling" and since water is not employed to impart heat, the rice obtained is not unattractive in colour. The need for storage of paddy for three to six months before it can be hulled is also obviated by this "Parboiling".

In common with other workers,⁵ I find that swelling of rice is a convenient measure of its quality. The method of measurement of swelling, developed in this laboratory, gives reproducible results. The swelling of rice (when it is cooked) is a complicated phenomenon and the individual rôles of starch, proteins and the capillary-active substances present in rice are now being investigated.

Another line of work that is being conducted in this laboratory is the preservation of rice bran and polishings without detriment to flavour and the B₁ vitamin content. The use in India of "Whole" rice is no doubt being vigorously advocated, but there are certain fairly well-known difficulties associated with the storage and use of unpolished rice. The storage of bran and polishings and their use as human food material are questions of great practical importance.⁶ It is of interest that while the bran layers of rice keep well when the cereal is in the unhulled state, the bran obtained on hulling, is difficult to keep in good condition. Whether the husk merely keeps out fat-splitting or oxidative micro-organisms, or whether the alkaloid⁷ present is in any way responsible is being studied. Rice bran itself has been found to be an anti-oxidant,⁸ and we are trying to reinforce this valuable property so that by inhibiting the development of undesirable odours we can safely

store rice bran and polishings and make them available for use as human food.

B. SANJIVA RAO.

Department of Chemistry,
Central College, Mysore University,
Bangalore,
February 14, 1938.

¹ K. Subbaramiah and B. Sanjiva Rao, *Proc. Ind. Acad. Sci.*, 1937, **6**, 36-58.

² M. R. Aswathanarayana Rao and B. Sanjiva Rao, "Physico-chemical investigations on varietal differences in rice"; B. Sanjiva Rao, "The physico-chemical factors determining quality in rice" [*Symposium on Colloids*, Indian Academy of Sciences, December 1935].

³ B. Sanjiva Rao, "Physico-chemical investigations on rice," *Proc. Ind. Sci. Cong.*, 1938. *Chemistry Section*.

⁴ Holmes, *Laboratory Manual of Colloid Chemistry*, 1934, p. 192.

⁵ Borasio, *Giorn. risicoltura*, 1935, **25**, 164; Cited from *Chemical Abstracts*, 1935, **29**, 7519.

⁶ West and Cruz, *Philippine J. Sci.*, 1933, **52**, 1.

⁷ Hofmeister, *Biochem. Z.*, 1920, **103**, 218.

⁸ Peters and Musher, *Ind. and Eng. Chem.*, 1937, **29**, 146.

Base Metal Thermocouples : Their Characteristics.

AMONGST the thermocouples that have been studied extensively,¹ the chief base metal ones are those with iron and copper; but owing to the susceptibility to oxidation at high temperatures, their frequent use is not very reliable. Copper-Constantan and Copper-Copel couples have been used for accurate temperature determinations at moderate temperatures (about 150° C.).^{2,3,4} We have studied the thermo-e.m.f. relations of some of the common base metal thermocouples and their characteristics will be published *in extenso* elsewhere.

We have found the use of Nichrome-Constantan couple quite reliable at moderately high temperatures (upto 800° C.). The couple gives almost a straight line thermo-e.m.f. relationship and as wide an e.m.f. as obtainable with Iron-Constantan and Copper-Constantan couples; moreover both the alloys can be satisfactorily used at high temperatures. Some of our observations for the Nichrome-Constantan couple were as below :