exhibit deviations from the behavior of an ideal solution of solid insoluble components has been established. Their behavior is probably due to solid solution. The existence of solid solutions between relatively close boiling hydrocarbons is reputedly sufficiently unusual to warrant a brief presentation of the preliminary results on these six systems, 2,3-dimethylbutane and 2,2-dimethylbutane, 2,3-dimethylbutane and 2-methylpentane, cyclopentane and 2,2-dimethylbutane, 1,2-butadiene and *cis*-butene-2, cyclohexane and methylcyclopentane, and 2,2,3-trimethylbutane and 2,4-dimethylpentane. Of these the first, fourth and fifth systems have components which boil within less than two degrees of each other and the rest have components boiling within nine degrees of each other. The results are summarized in Tables I and II.

TABLE I

SOLID SOLUTIONS FROM TRIPLE POINT MEASUREMENTS

System	Sample	Temperature 100% melted, °C.	Calcd. added impurity, mole %
1	2,3-Dimethylbutane	−128.23	
1	2,3-Dimethylbutane + 0.33% 2-methylpentane	−128.75	0.22
2	2,3-Dimethylbutane	−128.23	
2	2,3-Dimethylbutane + 0.94% 2,2-dimethylbutane	−127.31	Negative
3	1,2-Butadiene	−136.208	
3	1,2-Butadiene + 3.17% *cis*-Butene-2	−136.208	0.0

TABLE II

SOLID SOLUTIONS FROM FREEZING POINT MEASUREMENTS

System	Sample	Freezing point, °C.	Calcd. total impurity, mole %[a]
4	2,2-Dimethylbutane	−102.41	0.60
4	2,2-Dimethylbutane + 1.27% cyclopentane	−105.63	1.35
5	2,2,3-Trimethylbutane	− 26.269	0.56
5	2,2,3-Trimethylbutane + 2.16% 2,4-dimethylpentane	− 30.354	1.77
6	Cyclohexane	+ 6.363	0.08
6	Cyclohexane + 1.87% methylcyclopentane	+ 3.906	1.07

[a] With added impurity should equal original impurity entered immediately above plus added impurity.

From the disagreement between the actual and the calculated values of the added impurity, it is apparent that the systems do not behave normally, and it is likely that solid solutions are formed in all of the above systems. In the case of the neohexane–diisopropyl system, there is actually a rise in the melting point on the addition of neohexane, which is an almost certain indication of the presence of solid solution or compound formation or perhaps both.

These systems are being studied in more detail and results will be published as soon as available. The data for the phase diagrams for systems two and four are almost finished. The shape of the solidus and liquidus curves in both cases shows solid solution.

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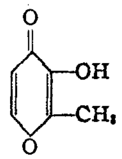
RECEIVED OCTOBER 24, 1945

THE FORMATION OF MALTOL BY THE DEGRADATION OF STREPTOMYCIN

Sir:

Hydrolysis of streptomycin chloride with *N* sodium hydroxide for three minutes at 100° or eighteen hours at 40° yields a weakly acidic substance, m. p. 161–162°, which has been characterized as maltol (I). *Anal.* Calcd. for $C_6H_6O_3$: C, 57.14; H, 4.80. Found: C, 57.19; H, 4.80.



I

The compound gives a brilliant violet color with ferric chloride, a positive iodoform test, reacts rapidly with nitric acid, and sublimes readily, even at 100°. These properties are in agreement with those of maltol as reported in the literature.[1] Furthermore, the **benzoate** melts at 114–115° (lit. 115–116°). *Anal.* Calcd. for $C_{13}H_{10}O_4$: C, 67.82; H, 4.40. Found: C, 67.57; H, 4.41. The **phenylurethan** melts at 152–153° (lit. 149–150°). *Anal.* Calcd. for $C_{13}H_{11}NO_4$: N, 5.71. Found: N, 5.66.

Maltol has been isolated from hydrolyzates of streptomycin salts ranging in purity from 280 to 800 units/mg. Assuming a molecular weight of 580 (free base),[2] the yields of maltol isolated in pure form are about 30% if one mole of maltol is assumed to be derived from one mole of streptomycin.

Maltol has a strong absorption at 274 mμ, E_m = 8400 in 0.1 *N* HCl; at 317 mμ, E_m = 7300 in 0.1 *N* NaOH. The formation of maltol by alkaline hydrolysis of streptomycin, as measured by the ultraviolet absorption in acid solution, appears to be quantitative. This suggests an assay procedure, for the absorption produced is proportional to the initial antibiotic activity in preparations having a potency of 50 to 800 units/-

(1) Kiliani and Bazlen, *Ber.*, **27**, 3115 (1894); Feuerstein, *ibid.*, **34**, 1804 (1901); Reichstein and Beitter, *ibid.* **63**, 824 (1930); Peratoner and Tamburello, *Chem. Zentr.*, **76**, II, 680 (1905).

(2) Peck, Brink, Kuehl, Flynn, Walti and Folkers, THIS JOURNAL, **67**, 1866 (1945).

ing. The ferric chloride color reaction also appears to be useful in this respect. The analytical application of these observations is being investigated.

We are indebted to E. F. Shelberg and L. F. Reed for microanalyses and to E. O. Krueger for determination of absorption spectra.

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RECEIVED NOVEMBER 16, 1945

NEW BOOKS

Willis Rodney Whitney, Pioneer of Industrial Research, by JOHN T. BRODERICK, Fort Orange Press, Inc., Publishers, 883 Broadway, Albany, New York, 1945. 324 pp. 14.5 × 21 cm. Price, $3.00.

W. R. Whitney was born in Jamestown, New York, on August 22, 1868. He graduated from the Massachusetts Institute of Technology in 1890 and was appointed assistant instructor in general chemistry. In 1892, he became full instructor; and it was after serving two years in that job that he went to the University of Leipzig for post graduate study under Wilhelm Ostwald, and received there the degree of Doctor of Philosophy in 1896. Then he spent six months at the Sorbonne in Paris studying organic chemistry under Charles Friedel.

He returned as instructor to the Massachusetts Institute of Technology. It was in colloids that his main interest lay, and he intended to devote his future researches chiefly to the colloid field. It seemed to him that colloid chemistry was the chemistry of living things, and in colloids was to be found the key to an understanding of many vital processes. He looked forward to help in the building up of a new branch of chemistry, now called biochemistry.

But the year 1900 brought a call to forsake the work and environment in which he was finding such satisfaction. He was approached by Edwin Wilbur Rice, Jr., then Vice President and Technical Director of the General Electric Company, with the proposal that he undertake the formation of a research laboratory for investigations in the electrical field.

Whitney was doubtful as to the advisability of accepting this offer and Rice then proposed that he try an experiment, dividing his time between Boston and Schenectady until he determined which place offered the more attractive prospects. He did this for three years and in 1904 decided to move to Schenectady. Under Whitney's direction the Research Laboratory grew and prospered. In 1928 Whitney was appointed Vice President of the Company in charge of research.

One of the big pieces of work done in Whitney's laboratory was Coolidge's development of ductile tungsten. Tungsten powder was mixed with starch paste, squirted through fine dies and reduced in hydrogen. Then Coolidge mixed tungsten powder with cadmium, mercury and bismuth instead of starch paste. Finally, Coolidge succeeded in drawing pure tungsten into wire and this is the process by which tungsten lamps are made in all countries at present.

The scientific star in Whitney's firmament was Langmuir. With the nitrogen-filled lamp he reduced the rate of evaporation of tungsten at high temperatures and obtained high light efficiencies with low heat losses. We now have good, clear, long-lived tungsten lamps.

Whitney's hobbies are interesting. Mr. Broderick quotes him as saying, p. 297: "A few years ago I was a guest on board the flag ship of our Atlantic Fleet. At the officers' mess, the Admiral carelessly started me talking about my turtle hobby. I told him there were at least three kinds of turtles, water, mud, and land. Nature had perpetuated these varieties to remind us of the history of growth, and so we find among turtles, first the self-satisfied, exclusively marine type, then the compromise, the half-land and water, or mud, and finally, the wholly land, or tortoise type. I had been reading about their brains. I reviewed the literature, which shows that the water turtle, if placed upon a shelf at high elevation, will immediately jump off and commit suicide. Fearful of everything new, and ignorantly assuming that water is always at hand, he jumps from a fancied log into the imaginary water and gets a real surprise. Water turtles are so inexperienced and stupid that even when blindfolded they do not hesitate, but jump at once. These show quick reflex action, but no reflection. The superior land turtle, on the other hand, has been ashore. He has had experiences which he remembers. Put on the same shelf, he will creep cautiously to the edge, look carefully about, and only jump when it seems safe. If blindfolded he prefers to sit still and work the bandage off before taking any chances.

"Now the interesting thing is that it is only among the land turtles that cortex, or grey matter, begins to show in animal brains. Water turtles are deficient in it."

This book gives an interesting sketch of an extremely interesting and able man. Whitney set the standard for a research director, possibly for all time.

WILDER D. BANCROFT

Annual Review of Biochemistry. JAMES MURRAY LUCK, *Editor*, Stanford University, and JAMES H. C. SMITH, *Associate Editor*, Carnegie Institution of Washington, Division of Plant Biology, Stanford University, California. Volume XIV. Annual Reviews, Inc., Stanford University P. O., California, 1945. x + 856 pp. 15.5 × 23.5 cm. Price, $5.00.

Volume XIV of the Annual Review of Biochemistry contains 28 articles dealing with topics similar to those in its preceding volumes. These are written by experts in their respective fields and cover practically all the important aspects of biochemistry of current interest. The large amount of factual material presented has been arranged in a clear, critical and discerning manner, successfully interpreting the trends of research and stimulating renewed attack upon disputed problems.

Some of the articles, such as "The Chemistry of the Carbohydrates," "The Chemistry of the Lipids,"" The Chemistry of the Amino Acids and Proteins" are primarily of a chemical nature, although the interrelationship of chemistry and biology in them is obvious. These are perhaps of equal interest to chemists and biologists. The articles on "Biological Oxidations and Reductions," "Enzymes that Hydrolyze the Carbon-Nitrogen Bond: Proteinases, Peptidases, and Amidases," "Nonproteolytic, Nonoxidative Enzymes" and "The Chemistry and Metabolism of the Compounds of Phosphorus," although bearing different titles, deal essentially with similar subject matter, the role of enzymes in living cells. The review on "Biological Oxidations and Reductions" by Lardy and Elvehjem and that on "The Chemistry and Metabolism of the Compounds of Phosphorus" by Kalckar, particu-