

in the very high pH ranges. A chlorine atom on the carbon next to the carboxyl affects the fungistatic properties of the acid, whereas the same substituent on the beta carbon atom has no effect. Constitutional factors are therefore of considerable significance on the biological effect of fatty acids.

Langmuir² pointed out that halogen substitution had an appreciable effect on the dissociation constant of a fatty acid. The theory³ is rather widely held that the biological activity of an acid is dependent on the dissociation constant; that is, the less ionized the acid, the more powerful its biological effect. The relative fungistatic properties of acetic and monochloroacetic, and of propionic and α -chloropropionic acids, when compared with their respective dissociation constants are in agreement with this theory. In the case of propionic and β -chloropropionic acids, however, the fungistatic properties are not so closely related to the dissociation constants. Propionic acid has a dissociation constant of 1.33×10^{-5} , and β -chloropropionic acid 8.59×10^{-5} ,² but the two acids have essentially identical fungistatic properties.

(2) Langmuir, *Chem. Rev.*, **6**, 465 (1929).

(3) (a) Tekelenburg, *Nederland. Tijdschr. Hyg. Microbiol. Serol.*, **2**, 176 (1927); (b) Bach, *Bull. sci. pharmacol.*, **39**, 7 (1932).

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The Preparation of Aurin Tricarboxylic Acid*

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Recent work in this Laboratory required the use of pure aurin tricarboxylic acid. Several methods of preparing this compound were tried, including those of Scherrer and Smith,¹ Heisig and Lauer,² and Caro.³ A product satisfactory for use in the determination of aluminum was obtained by each of these methods, but in no instance did the product contain more than 70% aurin tricarboxylic acid based on the air-dried material. The content of dye was determined by titration with titanium trichloride solution.⁴

In the course of the work it was observed that the material prepared by Caro's method would undergo a further reaction on treatment with a second portion of the oxidizing mixture (sodium

* Not copyrighted.

(1) Scherrer and Smith, Bureau of Standards Res. Paper RP1118.

(2) Heisig and Lauer, *Org. Syntheses*, **9**, 8 (1929).

(3) Caro, *Ber.*, **25**, 941 (1892).

(4) Evensen and Nagel, *J. Ind. Eng. Chem., Anal. Ed.*, **3**, 167 (1931).

nitrite-sulfuric acid solution). A study of this reaction developed the following modification of Caro's procedure which has several advantages over previously described preparations and yields a product of high purity. The methods of Heisig and Lauer, and of Scherrer and Smith, require that the temperature be kept below 5°. In the following procedure the reaction is not highly exothermic, and therefore no rigid temperature control is necessary. Caro recommends a purification with sodium bisulfite, which is difficult to perform and in the author's hands does not yield a pure product. In the modified procedure no purification of the reaction product is necessary except the removal of inorganic salts.

Experimental Part

Five grams of finely powdered sodium nitrite was added slowly and with vigorous stirring to 36 cc. of sulfuric acid, avoiding evolution of oxides of nitrogen. To this solution an intimate mixture of 10 g. of methylene-disalicylic acid⁵ and 5 g. of salicylic acid was added in small portions with vigorous stirring. After addition of all of the solid material, the mixture was allowed to stand for an hour with occasional stirring. It was then poured into a solution of 5 g. of sodium nitrite in 36 cc. of sulfuric acid, stirred, and allowed to stand overnight. The reaction mixture was added slowly to one liter of cold water, allowed to stand for an hour, and filtered on a Büchner funnel. The precipitate was suspended in one liter of warm water (50°) and filtered. This suspension and filtration was repeated, the free water removed by drawing air through the funnel, and drying was completed in a vacuum oven at 70°. The yield of dry product was 10.5 g. It titrated 97% aurin tricarboxylic acid.

(5) Vanino, "Präparative Chemie," Vol. II, 1937, p. 585.

FOOD DIVISION

U. S. FOOD AND DRUG ADMINISTRATION

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Type III Surface Tension Curves with Minimum in Dilute Solution in Pure Hydrocarbons

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Many properties of colloid systems in water are usually explained in terms of free ions, so that it becomes interesting to examine non-ionizing solvents to see in how far similar behavior is to be found where free ions are almost or quite lacking. One very striking property of many colloidal electrolytes in water is that in very dilute solution they lower the surface tension to about one-third that of water. The surface tension is then at a minimum and thereupon rises to a flat maximum in slightly less dilution. Some non-electrolytic detergents likewise similarly lower the surface