

boiling 95% ethyl alcohol to remove any adhering oil. A small amount of the compound dissolved and was recovered by concentrating the alcoholic extract. The "intermediate acid" was then purified by recrystallization from water. It is very soluble in hot water and slightly soluble in cold water. It crystallizes from water in colorless plates with two molecules of water of crystallization; yield, 55 g., 43%.

*Anal.* Subs., 1.3831, 1.4281: loss at 125°, 0.1463, 0.1512. Calcd. for  $C_{15}H_{15}O_4NS + 2H_2O$ :  $H_2O$ , 10.56. Found:  $H_2O$ , 10.82, 10.59. Subs., 0.3134, 0.2432:  $BaSO_4$ , 0.2399, 0.1863. Subs., 0.8400: cc. of 0.1 N  $H_2SO_4$ , 28.42. Calcd. for  $C_{15}H_{15}O_4NS$ : S, 10.51, N, 4.59. Found: S, 10.51, 10.52; N, 4.74.

Aqueous solutions of the acid change from colorless to a light greenish-yellow at  $pH$  3.4–3.6. The color is too faint for use as an indicator. At 230–235° the substance slowly decomposes forming a green liquid.

**Barium Salt.**—Five grams of barium carbonate was added to a solution of 5 g. of the acid in 150 cc. of water which was then boiled for two hours. The excess of barium carbonate was filtered off and the filtrate concentrated to crystallization. The following analyses proved the yellow, transparent crystals which separated to be the barium salt of 4<sup>1</sup>-dimethylaminobenzophenone-2-sulfonic acid with three molecules of water of crystallization.

*Anal.* Subs., 0.7378:  $BaSO_4$ , 0.2150. Subs., 1.0588: loss at 130°, 0.0716. Calcd. for  $(C_{15}H_{14}O_4NS)_2Ba + 3H_2O$ : Ba, 17.18;  $H_2O$ , 6.76. Found: Ba, 17.13;  $H_2O$ , 6.76. Subs., 0.9818:  $BaSO_4$ , 0.3090. Calcd. for  $(C_{15}H_{14}O_4NS)_2Ba$ : Ba, 18.42. Found: Ba, 18.50.

The barium salt is soluble in acetone, methanol, ethanol; slightly soluble in benzene, chloroform, carbon tetrachloride and insoluble in petroleum ether.

**Action of Anhydrous Ammonia.**—A sample of the dry acid was exposed to an atmosphere of dry ammonia until it was saturated. On standing in an evacuated desiccator over sulfuric acid for some time the excess ammonia was given off and the stable, yellow ammonium salt remained.

*Anal.* Subs., 1.2783:  $NH_3$ , 0.0768. Calcd. for  $C_{15}H_{15}O_4NS + NH_3$ :  $NH_3$ , 5.29. Found:  $NH_3$ , 5.67.

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**Note on  $\alpha,\beta$ -Dicyclohexylethylene Glycol.**—In a paper on the maximal catalytic reduction of benzoin,<sup>1</sup> a compound provisionally identified as  $\alpha,\beta$ -dicyclohexylethylene glycol was obtained. This compound has now been synthesized and the identification confirmed.

Attempts to condense hexahydromandelonitrile<sup>2,3</sup> and hexahydromandelamide<sup>3</sup> with cyclohexylmagnesium bromide,<sup>4</sup> with a view to the reduction of the resulting benzoin,<sup>5</sup> gave only unchanged materials. Monomolecular

<sup>1</sup> Buck and Ide, *THIS JOURNAL*, **53**, 3510 (1931).

<sup>2</sup> Zelinsky, *Ber.*, **41**, 2677 (1908).

<sup>3</sup> Godchot and Frezouls, *Compt. rend.*, **150**, 1248 (1910).

<sup>4</sup> Wood and Comley, *J. Soc. Chem. Ind.*, **42**, T429 (1923).

<sup>5</sup> Buck and Jenkins, *THIS JOURNAL*, **51**, 2163 (1929).

glyoxal<sup>6</sup> passed into a solution of cyclohexylmagnesium bromide gave a poor yield of the iso compound, iso- $\alpha,\beta$ -dicyclohexylethylene glycol, a result in line with the formation of iso-hydrobenzoin by a similar method.<sup>7</sup>

Finally, dodecahydrobenzoin was prepared by the method of Danilow and Venus-Danilowa.<sup>8</sup> This compound was reduced catalytically, and gave an excellent yield of a product which proved to be identical with the previously described compound melting at 194°. Mixed melting point determinations showed no depression.

**Hexahydromandelonitrile** is a pale yellow, fairly mobile oil, with a faint aromatic odor. It is surprisingly stable and may be distilled under reduced pressure (reported undistillable by Godchot and Frezouls<sup>3</sup>). It is smoothly converted by the Radziscewski<sup>9</sup> method into the amide<sup>3</sup>: b. p. 104° (0.70 mm.), 121° (1.6 mm.),  $d_{25}^{25}$  1.0163,  $n_D^{25}$  1.4716,  $M_D$  ( $n^2$ ) calcd. 38.29, found, 38.19.

*Anal.* Calcd. for C<sub>8</sub>H<sub>13</sub>ON: C, 69.01; H, 9.42. Found: C, 68.68; H, 9.72.

**Iso- $\alpha,\beta$ -dicyclohexylethylene Glycol.**—When recrystallized from aqueous alcohol, the compound forms a white, felted mass of slender needles. It is very soluble in absolute alcohol and in most of the usual solvents. Cold, concd. sulfuric acid gives no coloration. The melting point is 153° (corr.).

*Anal.* Calcd. for C<sub>14</sub>H<sub>26</sub>O<sub>2</sub>: C, 74.27; H, 11.59. Found: C, 74.61; H, 11.64.

<sup>6</sup> Harries and Temme, *Ber.*, **40**, 165 (1907).

<sup>7</sup> Wren and Still, *J. Chem. Soc.*, **103**, 1772 (1913).

<sup>8</sup> Danilow and Venus-Danilowa, *Ber.*, **62**, 2653 (1929).

<sup>9</sup> Method of Rupe and Majewski, *Ber.*, **33**, 3401 (1900).

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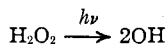
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## COMMUNICATIONS TO THE EDITOR

### THE PHOTOCHEMICAL REACTION BETWEEN HYDROGEN PEROXIDE AND HYDROGEN OR CARBON MONOXIDE IN THE GAS PHASE

Sir:

The absorption spectrum of gaseous hydrogen peroxide has been shown by Urey, Dawsey and Rice<sup>1</sup> to be continuous below 3000 Å. Their interpretation of the continuum favored the direct dissociation into OH radicals, namely



In order to test this point of view the writer carried out experiments to

<sup>1</sup> Urey, Dawsey and F. O. Rice, *THIS JOURNAL*, **51**, 1376 (1929).