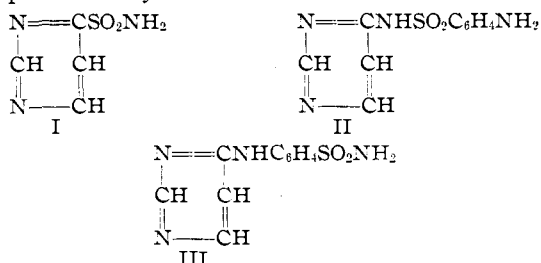


Derivative of pyrimidine- <i>p</i> -sulfonamide	M. p., °C.	Pyrimidine reactant and sulfanilamide	Formula	N analyses, %		
				Calcd.	Found	
2,6-Diaminophenyl	280-282	2,6-dichloro- <sup>5</sup>	C <sub>16</sub> H <sub>16</sub> O <sub>4</sub> N <sub>6</sub> S <sub>2</sub>	19.99	19.89	20.00
4-Methyl-2,6-diaminophenyl	218-220	2,6-dichloro-4-methyl- <sup>5</sup>	C <sub>17</sub> H <sub>18</sub> O <sub>4</sub> N <sub>6</sub> S <sub>2</sub>	16.63	16.70	16.60
2-Amino-6-aminophenyl	239-240 from water	2-amino-6-chloro- <sup>7</sup>	C <sub>10</sub> H <sub>11</sub> O <sub>2</sub> N <sub>6</sub> S	26.41	26.32	
6-Amino-2-aminophenyl	237-239	2-chloro-6-amino- <sup>5,8</sup>	C <sub>10</sub> H <sub>11</sub> O <sub>2</sub> N <sub>6</sub> S	26.41	26.30	26.37

effects characteristic of pyrimidines of the cytosine type.<sup>3</sup>

A large number of structural sulfonamide derivatives of pyrimidine are theoretically possible, and those in which the authors are immediately interested may be classified in three groups as follows: (1) simple sulfonamides of pyrimidine I, and (2) the isomeric constructions of types as represented by formulas II and III.



In Table I are recorded four new representatives of Class III which are easily synthesized by interaction of known pyrimidine halides with *p*-aminobenzene-sulfonamide. The reactions were carried out in alcohol solution. In case of extreme insolubility the sulfonamide derivative was purified by precipitation from alkaline solution with acetic acid. A comparison of the chemotherapeutic properties of these four derivatives will be reported in a future paper. For interesting syntheses already applied in the pyrimidine series the reader is referred to a recent paper from the Research Laboratory of the American Cyanamid Company.<sup>4</sup>

(3) G. de Sütö-Nagy (Kleibert) *Congr. Hungarian Physiol. Soc.* (1938); *Ref. Orvosi Hetilap*, No. 38 (1938).

(4) Roblin, Williams, Winnek and English, *THIS JOURNAL*, **62**, 2002 (1940).

(5) Hilbert and Johnson, *ibid.*, **52**, 1152 (1930).

(6) Gabriel and Colman, *Ber.*, **32**, 1333 (1899).

(7) Gabriel and Colman, *ibid.*, **36**, 3383 (1903).

(8) Gabriel and Colman, *ibid.*, **38**, 1689 (1905).

STERLING CHEMISTRY LABORATORY  
YALE UNIVERSITY

NEW HAVEN, CONNECTICUT RECEIVED MAY 21, 1941

### Preparation of 2-Methyl-3-*n*-hexadecyl-1,4-naphthoquinone

By M. TISHLER AND N. L. WENDLER

The preparation of 2-methyl-3-*n*-hexadecyl-1,4-naphthoquinone was undertaken in connection

with a study of the relation between vitamin K activity and structure.<sup>1</sup> The steps involved in this synthesis have been utilized recently in the preparation of 2-*n*-hexadecyl- and of 2-methyl-3-*n*-octadecyl-1,4-naphthoquinone.<sup>2</sup>

2-Methyl-5,6,7,8-tetrahydronaphthalene was condensed with palmitic acid chloride, the resulting ketone reduced by the Clemmensen method to the hydrocarbon, which after dehydrogenation with sulfur was oxidized with chromic acid to the corresponding naphthoquinone. Like other 2,3-dialkylated naphthoquinones, 2-methyl-3-hexadecyl-1,4-naphthoquinone does not respond to the Craven test with cyanoacetic ester and ammonia.<sup>3</sup>

2-Methyl-3-*n*-hexadecyl-1,4-naphthoquinone was found by W. L. Sampson of the Merck Institute for Therapeutic Research to have weak anti-hemorrhagic activity, the curative dose by the eighteen-hour chick test<sup>1</sup> being 200-300 micrograms. It should be noted that 2-methyl-3-*n*-octadecyl-1,4-naphthoquinone<sup>2a</sup> also shows only slight vitamin K activity.

**2-Methyl-3-*n*-pentadecyl-5,6,7,8-tetrahydronaphthyl Ketone.**—This substance was prepared from 2-methyl-5,6,7,8-tetralin and palmitic acid chloride by the action of anhydrous aluminum chloride in carbon disulfide. The ketone crystallized from ethanol and from petroleum ether melts at 53-55°, yield 45%.

*Anal.*<sup>4</sup> Calcd. for C<sub>27</sub>H<sub>44</sub>O: C, 84.28; H, 11.51. Found: C, 84.10; H, 11.58.

**2-Methyl-3-*n*-hexadecyl-5,6,7,8-tetrahydronaphthalene.**—The hydrocarbon was obtained by boiling the ketone in absolute ethanol with freshly amalgamated zinc and concentrated hydrochloric acid for twenty-four hours. After recrystallizing from ethanol, the product melted at 45°; yield 65%.

*Anal.* Calcd. for C<sub>27</sub>H<sub>46</sub>: C, 87.57; H, 12.43. Found: C, 87.69; H, 12.45.

**2-Methyl-3-*n*-hexadecylnaphthalene.**—A mixture of 4 g. of the tetralin and 0.85 g. of sulfur was heated with occasional stirring at 205-220° for three hours. The cooled mixture with 100 c of 10% sodium hydroxide was

(1) Fieser, Tishler and Sampson, *J. Biol. Chem.*, **137**, 659 (1941).

(2) (a) Fernholz, Ansbacher and MacPhillamy, *THIS JOURNAL*, **62**, 430 (1940); (b) Karrer and Epprecht, *Helv. Chim. Acta*, **23**, 272 (1940).

(3) Craven, *J. Chem. Soc.*, 1605 (1931).

(4) The authors gratefully acknowledge the microanalytical work done by Messrs. D. F. Hayman and W. Reiss.

boiled for thirty minutes and then extracted with chloroform. The chloroform extracts, washed thoroughly with water, were concentrated and a low melting solid was obtained which was recrystallized from ethanol (1.5 g., m. p. 38–40°).

**2-Methyl-3-*n*-hexadecyl-1,4-naphthoquinone.**—The oxidation was accomplished by adding a solution of chromic anhydride to the hydrocarbon in acetic acid at room temperature. After heating for one-half hour at 60°, the product was isolated by diluting with water, extracting with ether, and concentrating the extracts. Purification of the crude quinone was effected by converting it into the hydroquinone, washing the latter thoroughly with petroleum ether and reoxidizing with ferric chloride. The quinone was obtained from ether as pale yellow, fluffy needles melting at 98–98.5°; yield, 35%.

*Anal.* Calcd. for  $C_{27}H_{40}O_2$ : C, 81.81; H, 10.10. Found: C, 81.61; H, 10.22.

The dihydrodiacetate from petroleum ether melts at 78–79°.

*Anal.* Calcd.: C, 77.18; H, 9.54. Found: C, 77.03; H, 9.29.

RESEARCH LABORATORIES  
MERCK & CO. INC.

RAHWAY, NEW JERSEY RECEIVED SEPTEMBER 26, 1941

## The Densities of Morpholine–Water Solutions<sup>1</sup>

BY H. M. TRIMBLE AND ALICE FRANCES BUSE

Morpholine was prepared for this work by the commonly accepted method,<sup>2</sup> taking special precautions to exclude water and carbon dioxide of the air during its final distillation. The refractive index of several preparations at 20° was 1.4542 ± 0.0002.

TABLE I

DENSITIES OF MORPHOLINE–WATER SOLUTIONS

Morpholine % by weight	25°	Densities 30°	35°
14.17	1.0066	1.0047	1.0026
21.97	1.0128	1.0105	1.0083
26.72	1.0165	1.0140	1.0166
35.55	1.0238	1.0210	1.0180
47.36	1.0325	1.0290	1.0255
53.07	1.0355	1.0317	1.0280
57.05	1.0369	1.0330	1.0291
72.67	1.0352	1.0308	1.0264
84.05	1.0249	1.0204	1.0158
89.65	1.0164	1.0119	1.0073
100.00	0.9947	0.9897	0.9850

Each value of the density given in the table is the mean of four determinations, agreeing to one part in ten thousand or better, made with four different pycnometers.

(1) We wish to express our appreciation to the Carbide and Carbon Chemicals Corp., 30 East 42nd Street, New York, N. Y., who kindly supplied the morpholine used in this study.

(2) Friedman, Barnard, Doe and Fox. *THIS JOURNAL*, **62**, 2366 (1940).

Friedman, Barnard, Doe and Fox<sup>2</sup> have determined the specific gravities of morpholine–water solutions at 20°. The densities at this temperature, found by interpolation in their data and conversion, fall exactly in line with our own. The variation of density with temperature is nearly exactly rectilinear for all of the solutions. We find that the density of pure morpholine at 20° is 0.9994 as given by Dermer and Dermer,<sup>3</sup> not 1.0007 as quoted by Friedman, *et al.*, from Beilstein.

(3) Dermer and Dermer, *THIS JOURNAL*, **59**, 1148 (1937).

CHEMISTRY DEPARTMENT  
OKLAHOMA AGRICULTURAL AND MECHANICAL COLLEGE  
STILLWATER, OKLAHOMA RECEIVED AUGUST 20, 1941

## NEW COMPOUNDS

### Bicyclohexylidene-2,2'-sulfone

Four grams (4.2 cc., 0.025 mole) of dicyclohexenyl (di- $\Delta^{1,1'}$ -cyclohexene)<sup>1</sup> and 10–12 g. (0.16–0.19 mole) of liquid sulfur dioxide plus a few crystals of hydroquinone<sup>2</sup> were mixed in a glass-lined steel pressure tube. The tube was sealed and heated in a steam jacket for twelve hours. It was then cooled to about 10°, opened, and the excess sulfur dioxide allowed to pass off. The residual liquid was diluted with 6 cc. of petroleum ether (90–100°), the solution cooled in dry-ice and the walls of the tube scratched to induce crystallization. The crystalline mass was kept at 0° for about one hour and then suction filtered. Recrystallization from petroleum ether yielded 2.3 g. of practically colorless crystals, m. p. 76–77°, yield 50%.

*Anal.* Calcd. for  $C_{12}H_{18}SO_2$ : S, 14.16. Found: S, 14.02.

This procedure for synthesizing a sulfone is substantially that used by Eigenberger<sup>3</sup> in preparing the cyclic sulfone from isoprene. Bicyclohexylidene sulfone, like other compounds of this type, decomposes rapidly at 110–120° to form sulfur dioxide and dicyclohexenyl.

(1) Gruber and Adams, *THIS JOURNAL*, **57**, 2555 (1935).

(2) Staudinger, British Patent 361,341 (1930).

(3) Eigenberger, *J. prakt. Chem.*, **127**, 307 (1930).

WESTERN RESERVE UNIVERSITY OLIVER GRUMMITT  
CLEVELAND, OHIO CARL HELBER

RECEIVED SEPTEMBER 18, 1941

### Aminobenzene-(4-azo-1')-2'-methyl-4'-N-di-( $\beta$ -hydroxyethyl)-aminobenzene

To a hydrochloric acid solution of 3-methyl-N-di-( $\beta$ -hydroxyethyl)-aminobenzene prepared by the quantitative condensation of 1 mole of *m*-toluidine and 2 moles of liquid ethylene oxide under pressure, was added an equimolecular quantity of diazotized *p*-nitroaniline, prepared in the usual manner. A 20% solution of sodium acetate