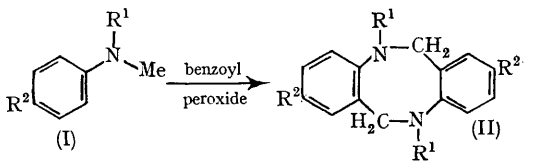
# The Formation of 5,11-Disubstituted 5,6,11,12-Tetrahydrophenhomazines

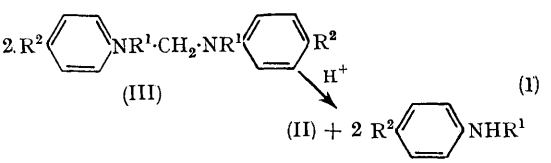
By G. A. SWAN

(*Department of Organic Chemistry, The University of Newcastle upon Tyne, Newcastle upon Tyne*, 1)

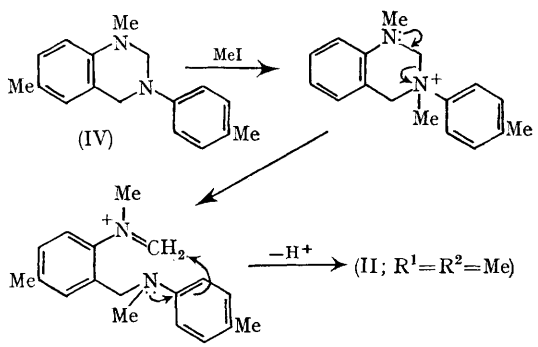
REACTION of benzoyl peroxide with *NN*-dimethylaniline (I; $R^1$ = Me, $R^2$ = H) or *NN*-dimethyl-*p*-toluidine (I; $R^1$ = $R^2$ = Me) under certain conditions yields phenhomazine derivatives (II).[1] In the second case and under different conditions, the α-diamine (III; $R^1$ = $R^2$ = Me) is also obtained.[1] Although the formation of (II; $R^1$ = $R^2$ = Me) is not surprising, the smooth production of (II; $R^1$ = Me, $R^2$ = H) is remarkable.




It has now been found that these phenhomazines (II) can be obtained from the α-diamines (III) by refluxing in chloroform in the presence of weak acids such as benzoic, pivalic, or picolinic acid. If the overall reaction is represented as in (1), then yields are (II; $R^1$ = Me, $R^2$ = H) (34%) and (II; $R^1$ = $R^2$ = Me) (70%). With strong acids (trifluoroacetic or toluene-*p*-sulphonic acid) yields are almost negligible. In the case of (III; $R^1$ = $R^2$ = Me) the product (II) can also be obtained in 85% yield by keeping a solution of the base in chloroform with a catalytic amount of an alkyl halide (*e.g.* benzyl chloride) for three days at room temperature.




We were able to prepare phenhomazines by reaction of benzoyl peroxide with amines (I) only when $R^1$ = Me. However, the new synthesis was successful with (III; $R^1$ = Et, $R^2$ = H), (III; $R^1$ = Et, $R^2$ = Me), and (III; $R^1$ = Ph, $R^2$ = H), giving 5,11-diethyl-5,6,11,12-tetrahydrophenhomazine (II; $R^1$ = Et, $R^2$ = H), m.p. 66°, $C_{18}H_{22}N_2$, mass spectral *M* 266, 5,11-diethyl-5,6,11,12-tetrahydro-2,8-dimethylphenhomazine (II; $R^1$ = Et, $R^2$ = Me), m.p. 81°, $C_{20}H_{26}N_2$, mass spectral *M* 294, and 5,6,11,12-tetrahydro-5,11-diphenylphenhomazine (II; $R^1$ = Ph, $R^2$ = H), m.p. 195°, $C_{26}H_{22}N_2$, mass spectral *M* 362, respectively. The mass spectra of the first two of the new derivatives showed strong peaks at (*M*/2 + 1) and (*M*/2 − 1), but in that of the third only the second of these two peaks was strong (*cf.* ref. 1).




The n.m.r. spectrum of (III; $R^1$ = $R^2$ = Me) in $CDCl_3$ at 60 MHz showed singlets at τ 7·76 (C-*Me*), 7·21(N-*Me*), and 5·40 ($CH_2$); when remeasured at 35° after the addition of benzoic acid (1 mol.), the sharp singlet at τ 7·76 was found to be scarcely changed, but the singlet at τ 7·21 had become broad and that at τ 5·40 had become so broad that its position could not be measured, although it seemed to have moved downfield. When the solution was then kept for some hours sharp peaks at τ 5·85 and 7·23 (II; $R^1$ = $R^2$ = Me) appeared. After a solution of (III; $R^1$ = Me, $R^2$ = H) in chloroform had been kept for 3 hr. at room temperature in the presence of *NN*-dimethylaniline and benzoic acid (1 mol.), much of (III) could be recovered after basification. It therefore seems that for the formation of phenhomazines the monoprotonated form of (III) is required and rapid exchange of protons must occur between the two nitrogen atoms.

The following illustrates another method of formation of phenhomazines and may be relevant to Farrar's[2] formation of (II; $R^1$ = $R^2$ = Me) from *N*-methyl-*p*-toluidine and formaldehyde. Formylation of 1,2,3,4-tetrahydro-6-methyl-3-*p*-tolylquinazoline[3] with acetic formic anhydride, followed

by reduction with lithium aluminium hydride gave 1,2,3,4-tetrahydro-1,6-dimethyl-3-*p*-tolylquinazoline (IV), m.p. 89°. When the latter was kept in chloroform with methyl iodide (1 mol.) for 2 days at room temperature and the solution then refluxed for 3 hr. and shaken with sodium hydroxide solution it yielded (II; $R^1 = R^2 = Me$).

(*Received, September 4th*, 1968; *Com.* 1202.)

[1] R. B. Roy and G. A. Swan, *Chem. Comm.*, 1966, 427.
[2] W. V. Farrar, *Chem. and Ind.*, 1967, 1644.
[3] E. Eisner and E. C. Wagner, *J. Amer. Chem. Soc.*, 1934, **56**, 1938.