

REACTION OF 1-PHENYL-4-HYDRAZINO-4,5-DIHYDRO-6H-FURO-
[2,3-d][1]BENZAZEPINE-5-CARBOXYLIC ACID HYDRAZIDE WITH
AROMATIC ALDEHYDES¹⁾

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1-Phenyl-4-hydrazino-4,5-dihydro-6H-furo[2,3-d][1]-benzazepine-5-carboxylic acid hydrazide (2) reacts with aromatic aldehydes in ethanol to give saturated monoarylylidene compounds (3a-c) and unsaturated monoarylylidene compounds (5a-c), respectively.

The reaction of α,β -unsaturated esters with hydrazine hydrate has been reported by Godtfredsen et al.²⁾. We applied this reaction to the synthesis of 1-phenyl-4-hydrazino-4,5-dihydro-6H-furo[2,3-d][1]benzazepine-5-carboxylic acid hydrazide (2) from ethyl 1-phenyl-6H-furo[2,3-d][1]benzazepine-5-carboxylate (1)³⁾ having a α,β -unsaturated α -amino ester moiety in the molecule. Next 2 was allowed to condense with aromatic aldehydes to afford saturated monoarylylidene compounds (3a-c) and unsaturated monoarylylidene compounds (5a-c). However in this case diarylylidene compounds (4) were not obtained.

2 was prepared in 60-70% yield by heating the mixture of 1 and hydrazine hydrate at 90-100° for 10 min or refluxing of ethanolic solution of 1 and hydrazine hydrate in the presence of sodium hydroxide. In the nmr spectrum of 2, doublets ($J=16$ Hz) observed at δ 3.97 and 3.76 were assigned to C_4 -H and C_5 -H of trans configu-

1) KOH
 2) ClCOOEt
 3) NH₂NH₂

1) NH₂NH₂

Ar-CHO
 EtOH, reflux

Ar-CHO
 EtOH, room temp.

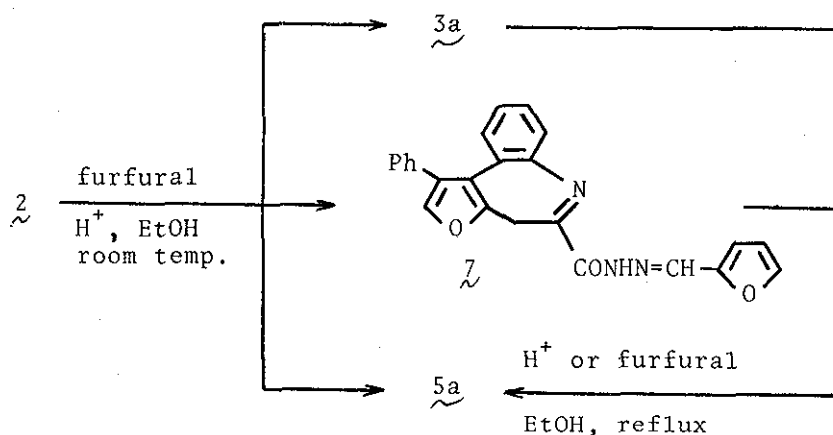
Ar-CHO
 EtOH, reflux

3a-c

4

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Furthermore, 2 reacts with four equivalents of furfural in ethanol containing a small amount of acetic acid at room temperature for 7 hr to give a new product 2 (44%), along with 3a (12%) and 5a (22%), respectively. The formation of 2 seems to be due to the 1,2-hydride shift to carbonium ion resulting from the elimination of 4-hydrazino group and consequent transfer of nitrogen lone pair. 2 was also isomerized to 5a by heating in ethanol containing acetic acid or furfural. The structures of these compounds synthesized here were supported by their elemental analyses and spectral data⁴⁾.



References

- 1) This constitutes Part XLIII of a series entitled "Studies on Heterocyclic Compounds" Part XLII: A. Tanaka, T. Usui and S. Yoshina, J. Pharm. Soc. Japan, submitted.
- 2) W. O. Godtfredsen and S. Vangedal, Acta Chem. Scan., 1955, 9, 1498.
- 3) K. Yakushijin, S. Yoshina and A. Tanaka, Heterocycles, 1977, 6, 721.

4) Elemental analyses (EA) and spectral data of 2, 3a, 5a, 5b, 6 and 7.

2 [mp 158-159°, colorless scales (EtOH)]

EA Found C; 65.41, H; 5.42, N; 20.23%.

Calcd. for $C_{19}H_{19}N_5O_2$ C; 65.31, H; 5.48, N; 20.05%.

IR (KBr, cm^{-1}) 3495, 3455, 3390, 3340, 3240, 1668, 1634.

NMR (δ in $CDCl_3$) 7.95 (1H, bs, NH), 7.67 (1H, s, C_2 -H), 7.24 (5H, s, phenyl-H), 7.22-6.71 (4H, m, C_{7-10} -H), 5.96 (2H, bs, NH x 2), 3.77 (4H, b, NH_2 x 2), 3.97 and 3.76 (2H, d x 2, J=16 Hz, $C_{4,5}$ -H).
MS (m/e) 349 (M^+).

3a [mp 207-208°, colorless needles (EtOH- $CHCl_3$)]

EA Found C; 67.51, H; 4.89, N; 16.31%.

Calcd. for $C_{24}H_{21}N_5O_3$ C; 67.43, H; 4.95, N; 16.39%.

IR (KBr, cm^{-1}) 3463, 3360, 3238, 3255, 3195, 1668, 1615.

NMR (δ in DMSO- d_6) 11.21 (1H, bs, NH), 8.35 (1H, s, N=CH), 7.94 (1H, s, C_2 -H), 7.82, 6.85 and 6.62 (3H, d; d and m, furyl-H), 7.43 (2H, bs, NH x 2), 7.23 (5H, s, phenyl-H), 7.22-6.51 (4H, m, C_{7-10} -H), 4.92 (2H, bs, NH_2), 3.81 and 3.62 (2H, d x 2, J=16 Hz, $C_{4,5}$ -H).
MS (m/e) 427 (M^+).

5a [mp 151-152°, reddish needles (EtOH- $CHCl_3$)]

EA Found C; 70.69, H; 5.20, N; 9.32%.

Calcd. for $C_{24}H_{17}N_3O_3EtOH$ C; 70.73, H; 5.25, N; 9.52%.

IR (KBr, cm^{-1}) 3315, 3190, 1625.

NMR (δ in DMSO- d_6) 11.76 (1H, bs, NH), 8.35 (1H, s, N=CH), 7.91 (2H, s, ring-H), 7.41 (5H, s, phenyl-H), 7.18-6.45 (8H, m, ring-H and NH), 4.37 (1H, t, OH), 3.52 and 1.11 (5H, C_2H_5).
MS (m/e) 395 (M^+).

5b [mp 224-226°, reddish needles (EtOH-CHCl₃)]

EA Found C; 69.31, H; 4.86, N; 8.47%.

Calcd. for C₂₆H₁₈N₃O₂ClEtOH C; 69.20, H; 4.98, N; 8.65%.

IR (KBr, cm⁻¹) 3310, 3185, 1620.

NMR (δ in DMSO-d₆) 11.67 (1H, b, NH), 8.31 (1H, s, N=CH), 7.77 (1H, s, C₂-H), 7.66 and 7.43 (4H, d x 2, *p*-chlorophenyl-H), 7.28 (5H, s, phenyl-H), 7.07-6.35 (6H, m, C₄-H, NH and C₇₋₁₀-H).

MS (m/e) 439 (M⁺).

6 [mp 212-213°, orange needles (EtOH)]

EA Found C; 71.99, H; 4.67, N; 13.04%.

Calcd. for C₁₉H₁₅N₃O₂ C; 71.91, H; 4.76, N; 13.24%.

IR (KBr, cm⁻¹) 3295, 3235, 3190, 3130, 1653, 1630.

NMR (δ in DMSO-d₆) 9.73 (1H, b, NH), 7.81 (1H, s, C₂-H), 7.36 (5H, s, phenyl-H), 7.12-6.35 (6H, m, C₄-H, NH and C₇₋₁₀-H), 4.48 (2H, b, NH₂).

MS (m/e) 317 (M⁺).

7 [mp 162-163°, pale yellow prisms (EtOH)]

EA Found C; 73.00, H; 4.21, N; 10.37%.

Calcd. for C₂₄H₁₇N₃O₃ C; 72.90, H; 4.33, N; 10.63%.

IR (KBr, cm⁻¹) 3260, 1662.

NMR (δ in CDCl₃) 10.52 (1H, bs, NH), 8.38 (1H, s, N=CH), 7.52, 6.84 and 6.47 (3H, d, d and m, furyl-H), 7.45 (1H, s, C₂-H), 7.32 (5H, s, phenyl-H), 7.17 (4H, m, C₇₋₁₀-H), 3.84 (2H, s, C₄-H).

MS (m/e) 395 (M⁺).

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