

Seiko Nan'ya*, Toshiaki Tange and Eturô Maekawa

Department of Industrial Chemistry, Nagoya Institute of Technology,
Gokiso, Showa-ku, Nagoya-shi 466, Japan

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2-Alkyl-1(2-formylphenyl-*N*-alkyliminomethyl)isoindoles were prepared by the reaction of *o*-phthalaldehyde with primary amines in 99% ethanol at 0°. 2-Alkyl-3-alkyliminoisoindolinones were isolated from the reaction mixture as by-products. Their formation mechanism is proposed.

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Although isoindoles are interesting fused *N*-heterocycles with high reactivity, however, their synthetic methods described until this communication are somewhat tedious [1-5].

The reaction between *o*-phthalaldehyde (**1**) and ammonia or primary amines produces dark-colored products [6]. The major products from ammonia were phthalimidine and 3-(2-cyanophenyl)isoquinoline. Compound **1** with primary amines produced *N*-substituted adducts but isoindole derivatives were not formed. However the reaction of **1** with primary amines in the presence of thiols gave 1-alkylthio-2-alkylisoindoles [7].

In this work we obtained 2-alkyl-1(2-formylphenyl-*N*-alkyliminomethyl)isoindoles **2** and 2-alkyl-3-alkyliminoisoindolinones **3** by the reaction of **1** with primary amines in 99% ethanol at 0° (ice bath) under a nitrogen atmosphere. In the presence of *t*-butyl alcohol, **2** was obtained in somewhat better yield. The structures of yellow **2** and colorless

3 were determined by their ir, nmr and mass spectra as well as elemental analysis. Using aniline as the primary amine, the major product was 1-phenylimino-2-phenylisoindoline (**4**). Although the yield of **2d** was very small, **2d** was inferred from its ir and mass spectra. *N*-Phenylisoindolinone was also obtained in addition to **2d** and **3d**.

t-Butylamine did not react with **1** under the same conditions, owing presumably to the steric hindrance of bulky *t*-butyl group.

The analytical and spectral data for the derivatives obtained in these reactions are listed in Tables 1 and 2.

The mechanism for the formation of **2** and **3** is proposed as shown in Scheme 1.

EXPERIMENTAL

Melting points were determined on a Yanaco micromelting point apparatus and are uncorrected. The infrared spectra were recorded on a JASCO DS-701G or A-102 spectrometer for potassium bromide disk. Nu-

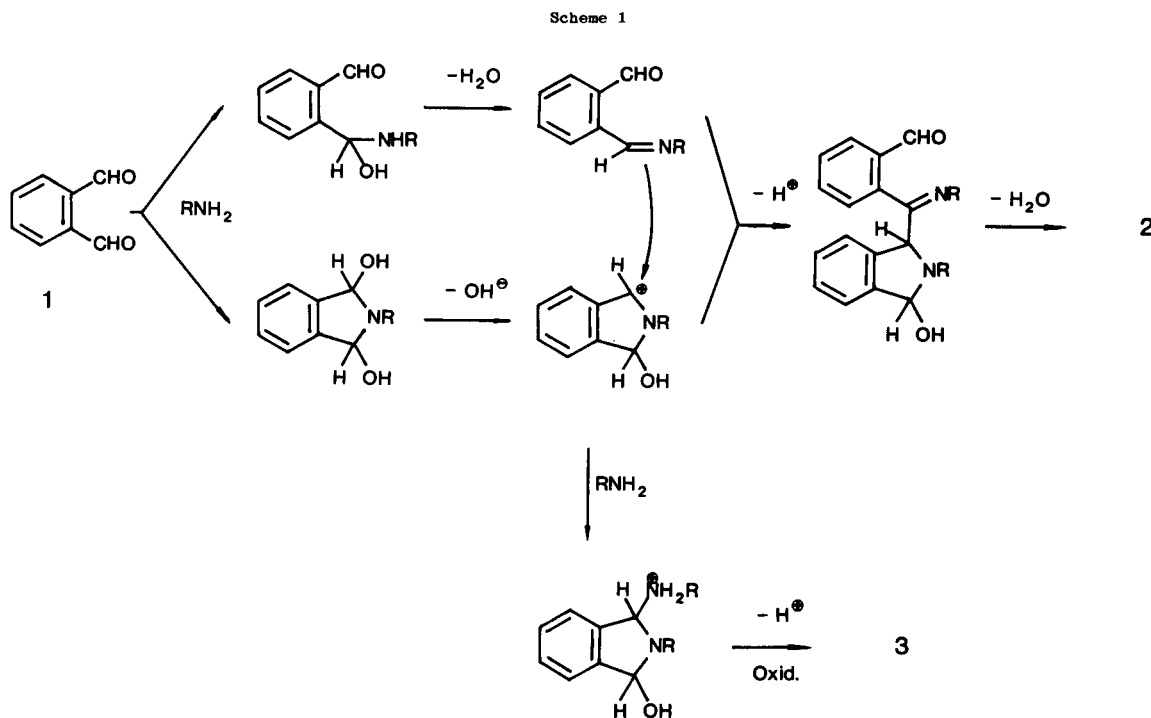
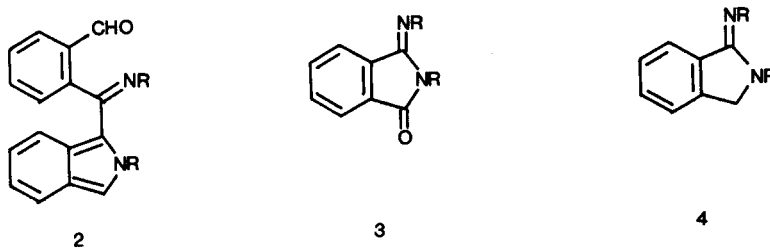


Table 1
Physical Data for Compounds 2, 3 and 4



Compound	R	Yield (%)	Mp (°C) or Bp (°C/Torr)	Molecular Formula	Elemental Analyses (%)			
					C	H	N	O
2a	<i>n</i> -propyl	35 29 [a]	> 155/1	C ₂₂ H ₂₄ N ₂ O (332.5) + 0.2H ₂ O [b]	78.63 (78.91)	7.32 (7.40)	8.41 (8.39)	5.71 (5.39)
2b	<i>i</i> -propyl	20	98-99	C ₂₂ H ₂₄ N ₂ O (332.5)	79.48 (79.20)	7.28 (7.27)	8.43 (8.30)	
2c	cyclohexyl	34	116.5-117.5	C ₂₈ H ₃₂ N ₂ O (412.6)	81.51 (81.55)	7.82 (7.93)	6.79 (6.84)	
3a	<i>n</i> -propyl	10 21 [a]	150-155/1	C ₁₄ H ₁₈ N ₂ O (230.3)	73.01 (72.72)	7.88 (7.93)	12.16 (11.72)	
3b	<i>i</i> -propyl	22	87-88	C ₁₄ H ₁₈ N ₂ O (230.3)	73.01 (73.11)	7.88 (7.88)	12.16 (12.09)	
3c	cyclohexyl	11	114-115	C ₂₀ H ₂₆ N ₂ O (310.4)	77.38 (77.13)	8.44 (8.48)	9.02 (8.80)	
3d	phenyl	2	144-145.5 150.5 [8]	C ₂₀ H ₁₄ N ₂ O (298.4)	80.52 (80.53)	4.73 (4.89)	9.39 (8.98)	
4d	phenyl	79	145-146.5 151-153 [9]					

[a] In the absence of *t*-butyl alcohol. [b] Compound **2a** contains 0.2 mole of water, showing 0.4 H at δ 2.19 in its nmr spectrum.

Table 2
Spectroscopic Data for Compounds 2, 3 and 4

Compound	Mass (M ⁺)	Infrared Spectrum (cm ⁻¹)	¹ H NMR Spectrum (Deuteriochloroform) (δ) [a]
2a	332	2825, 2725 and 1688 (CHO), 1625 (C=N)	10.33 (s, 1H, formyl), 8.02 (d, 2H, aromatic), 7.95-6.95 (m, 6H, aromatic), 6.3 (br, 1H, aromatic), 3.95 (m, 4H, 2 \times NCH ₂), 2.19 (s, 0.4H, water), 1.82 (m, 4H, 2 \times CH ₂), 1.34-0.78 (m, 6H, 2 \times CH ₃)
2a -2,4-DNPH [b]	512	1510 and 1328 (NO ₂)	
2b	332	2820, 2725 and 1690 (CHO), 1622 (C=N)	10.34 (s, 1H, formyl), 8.01 (bs, 2H, aromatic), 7.8-6.8 (m, 6H, aromatic), 6.45 (bs, 1H, aromatic), 5.14 (br, 1H, NCH), 4.64 (br, 1H, NCH), 1.58 (d, 6H, 2 \times CH ₃), 1.34 (bs, 6H, 2 \times CH ₃)
2c	412	2725 and 1685 (CHO), 1640 (C=N)	10.31 (s, 1H, formyl), 8.01 (d, 1H, aromatic), 7.89 (d, 1H, aromatic), 7.7-7.0 (m, 5H, aromatic), 6.84 (d, 1H, aromatic), 6.43 (s, 1H, aromatic), 4.50 (br, 1H, NCH), 4.23 (bs, 1H, NCH), 2.8-1.0 (m, 20H, cyclohexyl)
2c -2,4-DNPH [b]	592	1512 and 1325 (NO ₂)	
2d	400	2830, 2730 and 1690 (CHO), 1635 (C=N)	
3a	230	1721 (C=O), 1658 (C=N)	7.95 (m, 2H, aromatic), 7.65 (m, 2H, aromatic), 3.97 (t, 2H, NCH ₂), 3.79 (t, 2H, NCH ₂), 2.1-1.5 (m, 4H, 2 \times CH ₂), 1.07 (t, 3H, CH ₃), 0.94 (t, 3H, CH ₃)
3b	230	1713 (C=O), 1652 (C=N)	7.95 (m, 2H, aromatic), 7.64 (m, 2H, aromatic), 4.92-4.56 (m, 2H, 2 \times NCH), 1.52 (d, 6H, 2 \times CH ₃), 1.38 (d, 6H, 2 \times CH ₃)
3c	310	1723 (C=O), 1655 (C=N)	7.87 (m, 2H, aromatic), 7.62 (m, 2H, aromatic), 4.55-4.06 (m, 2H, 2 \times NCH), 2.6-1.0 (m, 20H, cyclohexyl)
3d	298	1733 (C=O), 1662 (C=N)	
4d	284	1660 (C=N)	8.04 (bs, 1H, aromatic), 7.74-6.86 (m, 12H, aromatic), 6.73 (bs, 1H, aromatic), 4.95 (s, 2H, CH ₂)

[a] s = singlet, d = doublet, t = triplet, m = multiplet, br = broad and bs = broad singlet. [b] 2,4-DNPH = 2,4-dinitrophenylhydrazine.

clear magnetic resonance spectra were measured on a Varian XL-200 spectrometer, using tetramethylsilane as the internal standard. Mass spectra were obtained with a Hitachi M-52 spectrometer. For column chromatography, Alumina Activated 300 (Nakarai Chemicals, Ltd.) and Aluminium oxide 90 (Merck, 70-230 mesh ASTM) were used. The starting materials, *o*-phthalaldehyde and primary amines were purchased from Nakarai Chemicals, Ltd. (guaranteed reagent). Aniline was distilled prior to use.

General Procedure for the Reaction of *o*-Phthalaldehyde and Primary Amines.

To a solution of 0.01 mole of *o*-phthalaldehyde (**1**) in 10 ml of 99% ethanol and 3 g (ca. 0.04 mole) of *t*-butyl alcohol, 0.01 mole of primary amine was added at 0°. The mixture was allowed to stand in an ice-bath under nitrogen atmosphere for 4-8 hours. The reaction time was decided according to the disappearance of starting materials on tlc. After the mixture was evaporated *in vacuo*, the residue was column chromatographed on aluminium oxide using benzene as eluent. From the first orange-yellow fraction **2** was obtained, and then from the following pale yellow fraction **3** was obtained. Compound **2a** was isolated from **3a** by the distillation using Glass Tube Oven GTO-250R (SIBATA) after column chromatogra-

phy. Compounds **2b,c** and **3b-d** were recrystallized from 95% ethanol. In the absence of *t*-butyl alcohol the yield of **2a** was poorer than in the presence of it.

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