Facile Denitrosation of cyclic *N*-Nitrosamines with Hydrazoic acid

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Supplementary Information

3,3-Dimethyl-2,7-diphenyl-1,4-diazepan-5-one (1)

In a typical reaction dry, powdered 3,3-dimethyl-2,6-diphenylpiperidin-4-one hydrochloride (10 g, 31.70 mmol) was added, in portions, to cold Con. H₂SO₄ (25 ml) in a conical flask equipped with a magnetic stirrer. After the dissolution was complete, the temperature of the solution was allowed to rise to 25°C. Then, NaN₃ (3 g, 46.15 mmol) was added in portions of 0.1 g, with vigorous stirring. After the addition was over, the solution was poured into crushed ice and stirred well with a glass rod and cold NaOH solution (2 N) was added slowly with stirring until the pH was 8. A white solid separated out. After keeping the mixture at room temperature for overnight the solid was separated by filtration through a Buchner funnel, washed free of NaOH and dried. The dried solid was dissolved in benzene and filtered through a fluted filter paper and the solution was concentrated. The solution was kept aside for crystallization. The crystals obtained were separated and then recrystallized from ethanol and pet ether (60-80°C). yield: 49.46 %, mp 210-211°C ; 209 - 210°C.^[9]

The compounds **9-13** have been prepared similarly.^[5]

2,6-Diphenylpiperidin-4-one (14)

Ammonium acetate (100 mmol), benzaldehyde (200 mmol) and acetone (200 mmol) were dissolved in ethanol (20 ml) and the resulting solution was heated on a hot plate with gentle swirling until the colour of the mixture changed to orange. The mixture was cooled under running tap water and poured into ether (100 ml). The ether insoluble 2,4,6,8-tetraphenyl-3,7-diazabicyclo[3.3.1]nonan-9-one was filtered off and conc.HCl (14 ml) was added to the filtrate. The precipitated *r*-2,*c*-6-diphenylpiperidin-4-one hydrochloride was collected by filtration and recrystallised from ethanol-ether by dissolving it in the minimum amount of ethanol and then adding dry ether until turbidity appeared in the cold solution. The hydrochloride was dispersed in acetone (50 ml) and concentrated aqueous ammonia was added drop wise until a clear solution was obtained. The solution was poured into cold water (500 ml) and the precipitated solid was collected and recrystallized from ethanol. mp: 101-102°C ; 102-103°C^[6]

3-Methyl-2,6-diphenylpiperidin-4-one (15)

Ammonium acetate (100 mmol) was dissolved in ethanol (80 ml) by heating. Benzaldehyde (200 mmol) and butan-2-one (100 mmol) were added to this solution and the mixture was heated until the colour of the solution changed to yellow. The solution was stored at room temperature for about 5 hours. The solid that precipitated was filtered off, washed and recrystallised from ethanol. mp: 86-87°C ; 85-86°C.^[8]

The compounds **16-19** have been prepared by following the similar procedure.^[6-8]

2,6-Diphenylpiperidine (26)

A mixture of piperidin-4-one (10 m.mol), and 80% hydrazine hydrate (3.1 ml.) in diethylene glycol (100ml) was heated on a steam bath for 2 hours. Potassium hydroxide pellets (2.8g) were added to the mixture and the contents were refluxed vigorously on a heating mantle for another 2 hours and the reaction mixture was cooled. The product formed was filtered and recrystallised from ethanol. Melting point: 69-70°C ; 69-71°C.^[6]

The compounds **27-31** have been prepared by following the similar procedure.^[6]

FIGURE S1: IR SPECTRUM OF 2,6-DIPHENYL-PIPERIDIN-4-ONE

FIGURE S2: IR SPECTRUM OF 3-METHYL-2,6-DIPHENYL-PIPERIDIN-4-ONE

FIGURE S3: IR SPECTRUM OF 3-ETHYL-2,6-DIPHENYL-PIPERIDIN-4-ONE

FIGURE S4: IR SPECTRUM OF 3-ISOPROPYL-2,6-DIPHENYL-PIPERIDIN-4-ONE

FIGURE S5: IR SPECTRUM OF 3,3-DIMETHYL-2,6-DIPHENYL-PIPERIDIN-4-ONE

FIGURE S6: IR SPECTRUM OF 3,5-DIMETHYL-2,6-DIPHENYL-PIPERIDIN-4-ONE

FIGURE S7: ¹H NMR SPECTRUM OF 3,3-DIMETHYL-2,6-DIPHENYL-PIPERIDIN-4-ONE

FIGURE S8: ¹³C NMR SPECTRUM OF 3,3-DIMETHYL-2,6-DIPHENYL-PIPERIDIN-4-ONE

FIGURE S9: IR SPECTRUM OF 2,6-DIPHENYL-PIPERIDINE

FIGURE S10: IR SPECTRUM OF 3-METHYL-2,6-DIPHENYL-PIPERIDINE

FIGURE S11: IR SPECTRUM OF 3-ETHYL-2,6-DIPHENYL-PIPERIDINE

FIGURE S12: IR SPECTRUM OF 3-ISOPROPYL-2,6-DIPHENYL-PIPERIDINE

FIGURE S13: IR SPECTRUM OF 3,3-DIMETHYL-2,6-DIPHENYL-PIPERIDINE

FIGURE S14: IR SPECTRUM OF 3,5-DIMETHYL-2,6-DIPHENYL-PIPERIDINE

FIGURE S17: IR SPECTRUM OF 3-METHYL-2,7-DIPHENYL-1,4-DIAZEPAN-5-ONE

FIGURE S18: IR SPECTRUM OF 3-ETHYL-2,7-DIPHENYL-1,4-DIAZEPAN-5-ONE

FIGURE S19: IR SPECTRUM OF 3-ISOPROPYL-2,7-DIPHENYL-1,4-DIAZEPAN-5-ONE

FIGURE S20: IR SPECTRUM OF 3,3-DIMETHYL-2,7-DIPHENYL-1,4-DIAZEPAN-5-ONE

FIGURE S21: IR SPECTRUM OF 3,5-DIMETHYL-2,7-DIPHENYL-1,4-DIAZEPAN-5-ONE

FIGURE S22: ¹H NMR SPECTRUM OF 3,3-DIMETHYL-2,7-DIPHENYL-1,4-DIAZEPAN-5-ONE

FIGURE S23: ^{13}C NMR SPECTRUM OF 3,3-DIMETHYL-2,7-DIPHENYL-1,4-DIAZEPAN-5-ONE

Table S1

Cpd No.	R¹	R²	R³	Yield (%)	m.p (°C)	Lit m.p(°C)
1	CH ₃	CH ₃	H	50	210-211	209-210 ^[9]
9	H	H	H	70	170-171	171-172 ^[5]
10	CH ₃	H	H	54	182-183	184-185 ^[5]
11	CH ₂ CH ₃	H	H	80	198-199	200-201 ^[5]
12	<i>i</i> -Pr	H	H	90	185-186	188-189 ^[5]
13	CH ₃	H	CH ₃	52	179-180	180-181 ^[5]
14	H	H	H	50	101-102	102-103 ^[6]
15	CH ₃	H	H	62	86-87	87 ^[6]
16	CH ₂ CH ₃	H	H	52	98-99	90-92 ^[6]
17	<i>i</i> -Pr	H	H	50	124-125	127 ^[6]
18	CH ₃	CH ₃	H	75	114-115	114-115 ^[8]
19	CH ₃	H	CH ₃	80	130-131	132-133 ^[8]
26	H	H	H	60	69-70	69-71 ^[6]
27	CH ₃	H	H	78	70-71	71-72 ^[6]
28	CH ₂ CH ₃	H	H	80	52-53	54 ^[10]
29	<i>i</i> -Pr	H	H	62	70-71	71-72 ^[10]
30	CH ₃	CH ₃	H	74	94-95	95-96 ^[7]
31	CH ₃	H	CH ₃	80	56-57	55-56 ^[6]
37	H	H	H	68	170-171	171-172 ^[5]
38	CH ₃	H	H	52	182-183	184-185 ^[5]
39	CH ₂ CH ₃	H	H	88	198-199	200-201 ^[5]
40	<i>i</i> -Pr	H	H	90	185-186	188-189 ^[5]
41	CH ₃	H	CH ₃	50	179-180	180-181 ^[5]

Table – S2

Compound	H₂	H_{5a}	H_{5e}	H_{6a}	H_{6e}	H_{7a}	amine NH	aromatic	CH₃	CONH
18 (3DMPO)	3.84	2.48	2.93	4.05	--	--	1.95	7.25-7.50	0.96, 1.20	--
24 (3DMP)	3.80	3.78	3.76	3.82	--	--	1.6	7.1-7.6	0.82, 0.97	--
1 (3DMHD)	3.87	--	--	3.09	2.56	4.03	1.88	7.17-7.36	0.88, 1.53	6.21

Table – S3

Compound	C6	C3	C7	C5	C2	<i>ipso</i>	C=O	aromatic	CH ₃ at C3
18 (3DMPO)	61.7	49.9	--	47.3	69.6	143.1, 139.3	212.9	128.9-126.6	20.4, 20.0
24 (3DMP)	58.5	28.7	--	27.1	66.4	141.2, 137.5	--	123.9-121.9	14.7, 24.0
1 (3DMHD)	47.1	56.0	61.2	--	73.9	144.7, 142.1	175.2	128.7-126.4	30.4, 21.5