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UDC 747.794.07

Studies on Mesoionic Compounds. II.[1] Synthesis of N-Acyl Derivatives of 3-Dialkylaminosydnonimines[2]

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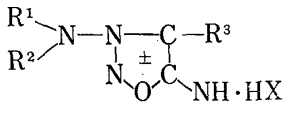
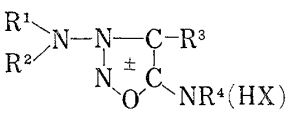
A number of N-acyl and N-nitroso-3-dialkylaminosydnonimines (II) were synthesized by various acylating methods. In some cases, the acylation with activated esters, mixed anhydrides or dicyclohexylcarbodiimide was found to be more favorable. The reactivities of these derivatives towards acids and alkalis were investigated. Trifluoroacetyl (II-6) and formyl (II-1) compounds were easily deacylated in varuous conditions. Methylation took place at the acylated imino nitrogen of N-ethoxycarbonyl compound to give the quaternary salt (II-18). N-Acetyl compound (II-2) was compared with its 3-alkyl analog in the physicochemical properties; its pK_a values reveals that the morpholino group has little effect on the basicity of the compound.

In the preceding paper[1] we reported the synthesis of 3-dialkylaminosydnonimines (I), some of which, especially 3-morpholinosydnonimine hydrochloride (Ia), exhibited a remarkable hypotensive activity in the animal tests.[4] This prompted us to synthesize derivatives of these pharmacologically active sydnonimines to see if they show superior properties to those of the original compound.



I

A : acid chloride
B : acid anhydride
C : isocyanate, ketene, *etc.*
D : activated ester
E : mixed anhydride
F : acid+DCC
G : $NaNO_2$



II

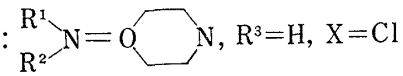
a :  , R^3=H, X=Cl

Chart 1

The acylation of 3-alkyl or 3-arylsydnonimines has been reported by several workers.[5] Moreover, the reaction has been achieved with various acylating agents[6] mostly in the pre-

1) Part I: K. Masuda, Y. Imashiro and T. Kaneko, *Chem. Pharm. Bull.* (Tokyo), **18**, 128 (1970).
2) Part of this work was presented at the 88th Annual Meeting of Pharmaceutical Society of Japan, Tokyo, April 1968.
3) Location: *Juso-Nishinocho, Higashiyodogawa-ku, Osaka.*
4) K. Kikuchi, M. Hirata, A. Nagaoka and Y. Aramaki, *Japan. J. Pharmacol.*, 20, 23 (1970).
5) *a*) H. Kato, M. Hashimoto and M. Ohta, *Nippon Kagaku Zasshi*, **78**, 707 (1957); *b*) V.F. Vasil'eva and V.G. Yashunskii, *Khim. Nauka i Promy.*, **1959**, 678; *c*) V.G. Yashunskii and V.G. Ermolaeva, *Zh. Obsch. Khim.*, **32**, 186 (1962); *d*) V.G. Yashunskii, V.F. Vasil'eva, L.E. Kholodov and M.N. Shchukina, *Zh. Obsch. Khim.*, **32**, 192 (1962); *e*) H.U. Daeniker and J. Druey, *Helv. Chim. Acta*, **45**, 2441 (1962); *f*) H.U. Daeniker and J. Druey, *Helv. Chim. Acta*, **45**, 2462 (1962); *g*) V.G. Yashunskii, L.E. Kholodov and O.I. Samoilova, *Collection Czech. Chem. Commun.*, **30**, 4257 (1965).
6) They are acid chlorides, acid anhydrides, isocyanates, isothiocyanates, diketene and so on.

sence of weak bases. We found that these known acylating procedures (A, B and C in Chart 1) can be successfully applicable to the acylation of I; thus we synthesized a number of N-acyl-3-dialkylaminosydnonimines (II), which are summarized in Table I. In some cases, other procedures (D, E and F) have been adopted for the acylation of sydnonimines and turned out to be more favorable; thus several derivatives (II-1,3,4,11 and 15), which were not obtained by the reaction of Ia with acid chlorides, were obtained in good yields by these procedures.

The hydrochlorides of I were considerably resistant to acylation in the absence of weak bases. Thus Ia was recovered unchanged on treatment with two equivalents of trifluoroacetic anhydride in trifluoroacetic acid, while it was acylated with a large excess of the anhydride. The formylation of Ia also did not proceed when it was refluxed with formic acid or treated with formic acid in acetic anhydride at room temperature.

It was found that the basicities of II vary with the properties of the acyl groups. The hydrochlorides of N-acetyl and N-propionyl derivatives (II-2 and 7) were readily obtained as crystals from the reaction mixtures which contained large amounts of pyridine, as has been known with the lower alkanoyl derivatives of 3-alkyl or 3-arylsydnonimines.[5e] Other acyl derivatives of Ia were obtained as free bases under similar conditions and they gave the hydrochlorides easily by the action of alcoholic hydrochloric acid. However, the trihalogenoacetyl derivatives (II-5 and 6) as well as the sulfonyl derivative (II-23), possessing strongly electron-withdrawing acyl groups at their imino nitrogen, did not afford the hydrochlorides, while the mono- and dichloroacetyl derivatives (II-3 and 4) and the formyl derivative (II-1) were partially[7] converted to the hydrochlorides when free bases were treated with two equivalents of alcoholic hydrochloric acid.

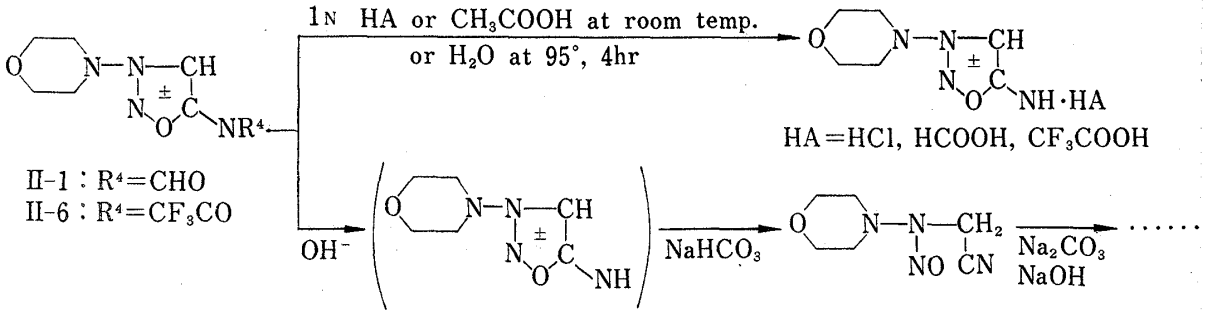
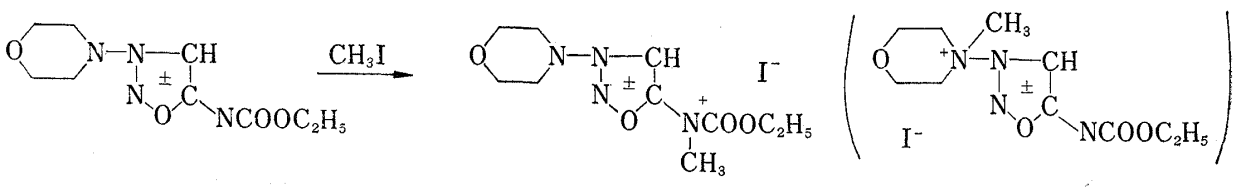


Chart 2

On the other hand, II-1 and II-6 were deacylated[8] with diluted hydrochloric acid at room temperature to give Ia. They were unstable towards alkali and suffered deacylation easily and went into decomposition to some unknown ring-opened products.[9] Moreover, hydrolysis

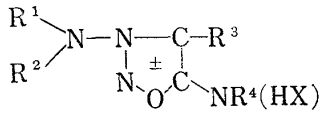


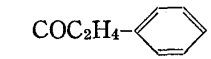
II-17 II-18 II-18'

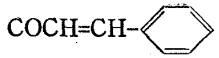
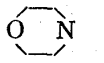
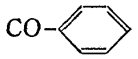
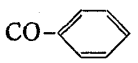
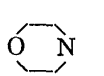
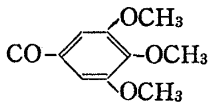
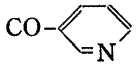
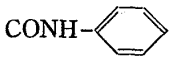
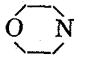
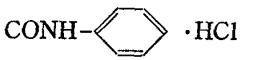
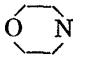
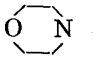
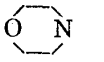
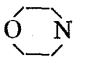
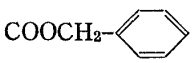
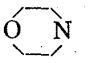
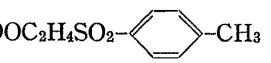
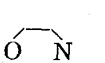
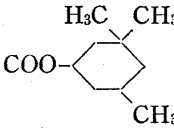
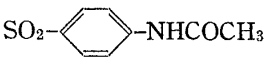
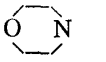
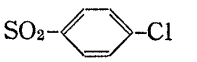
Chart 3

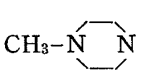
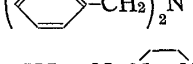
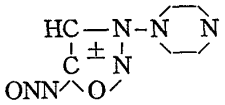
7) About 1/4 of the starting materials.
8) II-1 was partially (about 3/5) and II-6 was completely hydrolyzed in a few minutes.
9) These products will be reported later.

TABLE I. N-Acyl and N-Nitroso-3-dialkylaminosydnonimines



Compd. No.	R^1 / R^2 N	R^3	R^4 (HX)	Method[a]	Yield (%)	Recryst. solvent	mp (°C)	Formula	Analysis (%) Calcd. C	Calcd. H	Calcd. N	Found C	Found H	Found N
II-1		H	CHO	D E	80 87	EtOH	149—151 (decomp.)	$C_7H_{10}O_3N_4$	42.42	5.09	28.27	42.25	5.17	28.47
2		H	$COCH_3$	—	—	toluene	185.5—187.5 (decomp.)	$C_8H_{12}O_3N_4$	45.28	5.70	26.40	45.09	5.71	26.46
		H	$COCH_3 \cdot HCl$	B_1	84	EtOH	*ca.* 175 (decomp.)	$C_8H_{13}O_3N_4Cl$	38.64	5.27	22.53	38.77	5.26	22.23
3		H	$COCH_2Cl$	D	91	EtOH	105—107	$C_8H_{11}O_3N_4Cl$	38.95	4.50	22.72	39.07	4.56	22.61
4		H	$COCHCl_2$	D	89	EtOH	165—167 (decomp.)	$C_8H_{10}O_3N_4Cl_2$	34.18	3.59	19.93	34.46	3.52	19.91
5		H	$COCCl_3$	A_1	95	EtOH	180—181.5 (decomp.)	$C_8H_9O_3N_4Cl_3$	30.45	2.87	17.76	30.25	2.74	17.90
6		H	$COCF_3$	B_2	90	EtOH	167—168 (decomp.)	$C_8H_9O_3N_4F_3$	36.10	3.41	21.41	36.22	3.72	21.69
7		H	$COC_2H_5 \cdot HCl$	A_1 B_1	13 83	isoPrOH	169—171 (decomp.)	$C_9H_{15}O_3N_4Cl$	41.15	5.76	21.33	41.42	5.78	21.23
8		H	COC_2H_4– 	A_1	10	MeOH	127—129	$C_{15}H_{18}O_3N_4$	59.59	5.96	18.53	59.46	6.02	18.15
9		H	$COCH_2COCH_3$	C_2	49	MeOH	110—113	$C_{10}H_{14}O_4N_4$	47.24	5.55	22.04	47.30	5.33	21.25
10		H	$COCH_2O$– 	A_1 A_2	20 10	EtOH	149—151	$C_{14}H_{16}O_4N_4$	55.26	5.30	18.41	54.93	5.20	18.36
11		H	$COCH(CH_3)NHCbz$[b]	D E F	56 76 25	AcOEt–ether	108—110 (decomp.)	$C_{17}H_{21}O_5N_5$	54.39	5.64	18.66	54.13	5.49	18.70

12		H		A_1	67	MeOH	184—187	$C_{15}H_{16}O_3N_4$	59.99	5.37	18.66	59.85	5.46	18.54
13		H		A_1	85	MeOH	186—188	$C_{13}H_{14}O_3N_4$	56.93	5.14	20.43	56.68	5.27	20.52
		H	 ·HCl	—	—	EtOH	159—160 (decomp.)	$C_{13}H_{15}O_3N_4Cl$	50.25	4.87	18.03	50.34	4.78	17.99
14		H		A_1	44	MeOH	175—177	$C_{16}H_{20}O_6N_4$	52.74	5.53	15.38	52.55	5.36	15.11
15		H		E	10	MeOH	202—204	$C_{12}H_{13}O_3N_5$	52.36	4.76	25.44	52.08	4.70	25.80
16		H		C_1 C_2	63 29	MeOH	162 (decomp.)	$C_{13}H_{15}O_3N_5$	53.97	5.23	24.21	54.04	5.53	24.29
		H		—	—	MeOH	175—176 (decomp.)	$C_{13}H_{16}O_3N_5Cl$	47.93	4.95	21.50	47.86	4.96	21.57
17		H	$COOC_2H_5$	A_1 A_2	51 89	toluene	140—141	$C_9H_{14}O_4N_4$	44.62	5.83	23.13	44.57	5.85	23.19
		H	$COOC_2H_5 \cdot HCl$	—	—	EtOH–ether	139—141 (decomp.)	$C_9H_{15}O_4N_4Cl$	38.79	5.43	20.10	39.08	5.38	20.28
18		H	$COOC_2H_5 \cdot CH_3I$	—	36	EtOH–ether	107 (decomp.)	$C_{10}H_{17}O_4N_4I$	31.26	4.46	14.58	31.41	4.48	14.45
19		H		A_2	48	MeOH	115—116	$C_{14}H_{16}O_4N_4$	55.25	5.30	18.41	55.39	5.29	19.01
20		H		A_2	50	MeOH	70	$C_{16}H_{20}O_6N_4S \cdot H_2O$	46.37	5.35	13.52	46.76	5.36	13.26
21		H		A_2	94	EtOH	172—174	$C_{16}H_{26}O_4N_4$	56.79	7.74	16.56	57.10	7.52	16.30
22		H		A_1	56	EtOH	198—199 (decomp.)	$C_{14}H_{17}O_5N_5S$	45.77	4.66	19.06	45.74	4.80	18.63
23		H		A_1	78	EtOH	178—179 (decomp.)	$C_{12}H_{13}O_4N_4SCl$	41.80	3.80	16.25	41.50	3.72	16.13

24		H	NO	G	83	MeOH	130 (decomp.)	$C_6H_9O_3N_5$	36.18	4.55	35.16	36.06	4.53	34.94
25	$(CH_3)_2N$	H	CO- 	A_1	57	EtOH	127—128	$C_{11}H_{12}O_2N_4$	56.89	5.21	24.13	56.86	5.20	24.31
26	$(CH_3)_2N$	CH_3	CO- 	A_1	15	MeOH	109—110	$C_{12}H_{14}O_2N_4$	58.52	5.73	22.75	58.60	5.85	22.74
27	$(CH_3)_2N$	H	$COOC_2H_5$	A_2	72	ether	84	$C_7H_{12}O_3N_4$	41.99	6.04	27.99	42.27	5.99	28.02
28	$(CH_3)_2N$	H	NO	G	56	EtOH	112—113	$C_4H_7O_2N_5$	30.57	4.49	44.57	30.76	4.48	44.70
29		H	CO- 	A_1	72	EtOH	175	$C_{14}H_{16}O_2N_4$	61.75	5.92	20.58	61.87	6.01	20.85
30		H	NO	G	71	H_2O	121—122 (decomp.)	$C_7H_{11}O_2N_5$	42.63	5.62	35.52	42.53	5.54	35.57
31		H	CO- 	A_1	50	EtOH	116—118	$C_{15}H_{18}O_2N_4$	62.92	6.34	19.57	62.80	6.33	19.65
32		H	NO	G	49	H_2O	84—86 (decomp.)	$C_8H_{13}O_2N_5$	45.49	6.20	33.16	45.57	6.23	33.05
33		H	NO	G			132—134 (decomp.)							
34		H	NO	G		EtOH	132—133 (decomp.)	$C_7H_{12}O_2N_6$	39.62	5.70	39.60	39.79	5.49	39.75
35	$(C_4H_9)_2N$	H	NO	G			53							
36		CH_3	NO	G			103—106 (decomp.)							
37		H	NO	G			168—169 (decomp.)	$C_8H_{10}O_4N_{10}$	30.97	3.25	45.15	31.19	3.42	44.95

a) A_1: acid chloride in pyridine, A_2: acid chloride in aqueous solution of $NaHCO_3$, B_1: acid anhydride in pyridine, B_2: acid anhydride, C_1: isocyanate in pyridine, C_2: ketene (II-9) or isocyanate (II-16) in aqueous solution of $NaHCO_3$, D: *p*-nitrophenyl ester in aqueous solution of $NaHCO_3$, E: mixed anhydride, F: acid and dicyclohexylcarbodiimide, G: $NaNO_2$ in H_2O

b Cbz: carbobenzyloxy

of II-1 and II-6 took place when they were heated in water at 95° for four hours to afford the formic and trifluoroacetic acid salts of 3-morpholinosydnonimine, respectively. In these reactions II-6 was less stable than II-1.

The alkylation of acylated imino nitrogens of sydnonimines has been reported by Russian workers,[10] who described that N-acetyl and N-carbomethoxy-3-phenylsydnonimines were methylated with methyl iodide, and that the methylation of the latter compound was accompanied by decarboxylation to give N,N-dimethyl-3-phenylsydnonimine iodide. However, all attempts by other workers[5e] at the quaternization of N-acylsydnonimines with the same reagent thus far met with failures. We found that the methylation of II-17 afforded the corresponding quaternary salt (II-18) without being accompanied by decarboxylation. The structure of this compound was determined by the infrared spectrum: Two strong absorption bands of the product at 1740 cm^{-1} ($\nu_{C=O}$) and 1620 cm^{-1} ($\nu_{C=\overset{+}{N}}$) are typical of the imonium structure of N-acylsydnonimine salts.[10] It should be mentioned that an alternative structure (II-18′) would be ruled out on the basis that the above infrared spectrum was different from the spectra of free bases of N-acylsydnonimines, whose absorption bands are in the region of 1620—1650 ($\nu_{C=O}$) and 1540—1560 cm^{-1} ($\nu_{C=N}$).

Each of II exhibits similar spectral aspects to those of N-acyl derivatives of 3-alkylsydnonimines as exemplified by the compounds listed in Table II. A small difference of the pK_a values between two sydnonimines reveals that the morpholino group of II-2 has little effect on the basicity of the compound.

The nitrosation of I was carried out as described previously.[5a] All the nitroso derivatives thus obtained were colored crystals, some of which decomposed to give the corresponding sydnones.[11]

Table II. Spectral Data and pK_a Values of N-Acetylsydnonimines

		NMR[a] (τ)		IR[b] (cm^{-1})			UV[c] ($m\mu$) λ_{max}		pK_a[d]
		Ring H	$COCH_3$	$\nu_{C=O}$	$\nu_{C=N}$	Amide II or δ_{N-H}			
A	free base	2.00	7.81	1630	1550		239	324	4.8
	HCl salt	1.18	7.60	1730	1620	1555	280		
B	free base	1.96	7.79	1620	1555		241	322	4.5
	HCl salt	1.09	7.62	1725	1620	1530	288		

A: N-acetyl-3-cyclohexylsydnonimine
B: N-acetyl-3-morpholinosydnonimine (II-2)
a) the nuclear magnetic resonance chemical shifts at 60 Mc in $CDCl_3$ (base) and in D_2O (salt)
b) the infrared absorption bands in KBr
c) the ultraviolet absorption spectra in EtOH (base) and in 0.1N HCl (salt)
d) determined in 10% MeOH

Experimental[12]

General Procedure for the Preparation of N-Acyl-3-dialkylaminosydnonimines (II)——Acylation of I by the methods A, B or C was carried out as described previously.[5e] The crude product obtained from the reaction mixture was purified by silica gel column chromatography if necessary, and recrystallized with solvents listed in Table I.

N-Formyl-3-morpholinosydnonimine (II-1)——Method D: To a suspension of Ia (3.0 g) in H_2O (30 ml) was added $NaHCO_3$ (1.3 g) with ice-cooling and stirring. After 10 min a solution of *p*-nitrophenyl formate[13] (3.0 g) in tetrahydrofuran (THF) (20 ml) was added dropwise with ice-cooling and stirring. The

10) V.G. Yashunskii, D.I. Samoilova and L.E. Kholodov, *Zh. Obshch. Khim.*, **34**, 2050 (1964).
11) Details will be reported later.
12) All melting points are uncorrected.
13) K. Okawa and S. Hase, *Bull. Chem. Soc. Japan*, **36**, 754 (1963).

mixture was further stirred for 2 hr, then the temperature of the reaction mixture was elevated up to room temperature. After evaporation of THF *in vacuo* and subsequent extraction of *p*-nitrophenol and unreacted reagent with ether, the objective compound was extracted several times with AcOEt. The extract was dried and the solvent was removed *in vacuo* to leave crude crystals, which were recrystallized to give II-1 (2.3 g).

Method E: A solution of Ia (3.0 g) in an excess amount of acetic formic anhydride[14] was kept standing overnight at room temperature. The reaction mixture was evaporated to dryness *in vacuo* to leave crude crystals, which were recrystallized to give II-1 (2.5 g).

N-Monochloroacetyl-3-morpholinosydnonimine (II-3) and N-Dichloroacetyl-3-morpholinosydnonimine (II-4)——The reaction of Ia (4.0 g) with *p*-nitrophenyl monochloroacetate (4.5 g)[15] or dichloroacetate (5.0 g)[15] in the presence of $NaHCO_3$ (1.7 g) was carried out by a similar manner to the preparation of II-1. From the reaction mixture THF was evaporated *in vacuo*, and the residue was diluted with H_2O to separate crude crystals, which were washed with H_2O and ether. Recrystallization of the crystals afforded II-3 (4.5 g) and II-4 (5.0 g).

N-Trichloroacetyl-3-morpholinosydnonimine (II-5)——To a suspension of Ia (3.1 g) in dry pyridine (25 ml) was added trichloroacetyl chloride (3.0 g) with ice-cooling and stirring, and the mixture was further stirred for 4 hr at 5—10°. The reaction mixture was cooled again with ice, and diluted with H_2O (50 ml) to separate crude crystals, which were washed with H_2O and recrystallized to give II-5 (4.5 g).

N-Trifluoroacetyl-3-morpholinosydnonimine (II-6)——A solution of Ia (2.0 g) in an excess amount of trifluoroacetic anhydride was kept standing overnight at room temperature. The reaction mixture was evaporated to dryness under reduced pressure to leave crude crystals, which were carefully recrystallized to give II-6 (2.3 g).

N-(N′-Carbobenzyloxy-L-alanyl)-3-morpholinosydnonimine (II-11)——Method D: To a suspension of Ia (2.0 g) in H_2O (20 ml) was added $NaHCO_3$ (0.9 g) with ice-cooling and stirring. After 10 min a solution of N-carbobenzyloxy-L-alanine *p*-nitrophenyl ester (4.0 g) in THF (10 ml) was added dropwise with ice-cooling and stirring. The mixture was further stirred for 2 hr, then the temperature of the reaction mixture was elevated up to room temperature. $NaHCO_3$ (1.0 g) was added and the mixture was extracted 3 times with AcOEt. The extract was dried and the solvent was removed *in vacuo* to leave an oily substance, which was purified by silica gel column chromatography and recrystallized to give II-11 (2.1 g).

Method E: To a mixture of N-carbobenzyloxy-L-alanine (0.67 g) and triethylamine (0.42 g) in THF (6 ml) was added dropwise ethyl chloroformate (0.29 ml) with ice-cooling and stirring, and then the mixture was further stirred for 15 min. To the mixed anhydride solution thus obtained was added dropwise wtih ice-cooling and stirring a suspension which was prepared by the treatment of Ia (0.6 g) with $NaHCO_3$ (0.26 g) in H_2O (6 ml) at 0°. The stirring was continued for 1 hr, then the temperature of the reaction mixture was elevated up to room temperature. The reaction mixture was extracted 3 times with AcOEt. The extract was dried and the solvent was removed *in vacuo* to leave crude crystals, which were washed with ether and recrystallized to give II-11 (0.86 g).

Method F: A mixture of N-carbobenzyloxy-L-alanine (2.7 g) and dicyclohexylcarbodiimide (2.5 g) in CH_3CN (100 ml) was stirred for 2 hr at room temperature. To this were added Ia (2.0 g) and dry pyridine (1.6 g), and the mixture was stirred for about 10 hr. Precipitates separated from the reaction mixture were filtered and the filtrate was concentrated *in vacuo* to leave an oily substance, which was purified by silica gel column chromatography and recrystallized to give II-11 (0.94 g).

N-Nicotinoyl-3-morpholinosydnonimine (II-15)——To a suspension of nicotinic acid (1.2 g) in dry THF (10 ml) were added ethyl chloroformate (1.1 g) and triethylamine (1.0 g) with ice-cooling and stirring, then the crystals of triethylamine hydrochloride which precipitated from the reaction mixture were removed by filtration. To this mixed anhydride solution was added dropwise with ice-cooling and stirring a suspension which was prepared by the treatment of Ia (2.0 g) with $NaHCO_3$ (0.8 g) in H_2O (20 ml) at 0°, and the stiring was continued for a while. The reaction mixture was extracted with AcOEt. The extract was dried, and the solvent was removed *in vacuo* to leave crude crystals, recrystallization of which afforded II-15 (0.3 g).

N-Methyl-N-ethoxycarbonyl-3-morpholinosydnonimine Iodide (II-18)——To a solution of N-ethoxycarbonyl-3-morpholinosydnonimine (II-17) (1.3 g) in acetone (25 ml) was added methyl iodide (1 ml), then the mixture was warmed for 3 hr at 50—60°. At the end of this period another portion of methyl iodide (1 ml) was added and the mixture was further warmed for 3 hr at the same temperature to complete the reaction. The solvent was removed from the reaction mixture to leave an oily substance, which was washed with ether. A small amount of acetone was added to the residue, which solidified as yellow crystals (1.0 g). They were recrystallized to give II-18 (0.75 g).

N-2-*p*-Tolylsulfonylethoxycarbonyl-3-morpholinosydnonimine (II-20)——To a mixed solution of Ia (4.0 g) and $NaHCO_3$ (3.5 g) in H_2O (40 ml) was added 2-*p*-tolylsulfonylethyl chloroformate (6.0 g)[16] with

14) I. Muramatsu, M. Murakami, T. Yoneda and A. Hagitani, *Bull. Chem. Soc. Japan*, **38**, 244 (1965).
15) R. Buyle, *Helv. Chim. Acta*, **47**, 2449 (1964).
16) A.T. Kader and C.J.M. Stirling, *J. Chem. Soc.*, **1964**, 262.

ice–cooling and stirring. The mixture was kept standing for 2—3 hr to precipitate crystals, which were recrystallized to give II-20 (2.0 g).

N-Nitroso-3-morpholinosydnonimine (II-24)——To a solution of Ia (1.0 g) in H_2O (5 ml) was added a solution of $NaNO_2$ (0.4 g) in H_2O (15 ml) with ice–cooling and stirring. The mixture was stirred for 6 hr, and kept standing overnight to precipitate yellow crystals, which were collected and recrystallized to give II-24 (0.8 g).

3-Dimethylamino-4-methylsydnonimine Hydrochloride——This was prepared by the same procedure as described previously.[1] From the reaction of 1,1-dimethylhydrazine (5.0 g) with 80% MeCHO (4.6 g) and $NaHSO_3$ (8.7 g) followed by the treatment with NaCN (4.2 g) was obtained 1,1-dimethyl-2-α-cyanoethylhydrazine (8.0 g), bp 60—72° at 15 mmHg. Nitrosation of this hydrazine (5.7 g) with HCl (6 ml) and $NaNO_2$ (4.0 g) followed by the action of methanolic hydrochloric acid gave colorless crystals (4.0 g), mp 175—177° (decomp.) (from EtOH). *Anal.* Calcd. for $C_5H_{11}ON_4Cl$: C, 33.62; H, 6.21; N, 31.31. Found: C, 33.80; H, 6.13; N, 31.54.

3-(4′-Methylpiperazino)sydnonimine Dihydrochloride——From the reaction of 4-methyl-1-aminopiperazine (30 g) with $HOCH_2SO_3Na \cdot H_2O$ (40 g) followed by the treatment with KCN (16.5 g) was obtained 4-methyl-1-cyanomethylaminopiperazine (16.5 g), bp 83—87° at 0.15 mmHg. Nitrosation of this piperazine (11.5 g) with HCl (15 ml) and $NaNO_2$ (15 g) followed by the action of methanolic hydrochloric acid gave colorless crystals (10 g), mp 185—187° (decomp.) (from MeOH). *Anal.* Calcd. for $C_7H_{15}ON_5Cl_2$: C, 32.82; H, 5.90; N, 27.34. Found: C, 32.86; H, 6.20; N, 27.29.

3-Dibenzylamino-4-methylsydnonimine Hydrochloride——The reaction of 1,1-dibenzylhydrazine (5.5 g) with lactonitrile (1.9 g) afforded 1,1-dibenzyl-2-α-cyanoethylhydrazine. Nitrosation of this crude hydrazine (2.0 g) with nitrous gas in MeOH followed by the action of methanolic hydrochloric acid gave colorless crystals (1.6 g), mp 151—153° (decomp.) (from iso PrOH). *Anal.* Calcd. for $C_{17}H_{19}ON_4Cl \cdot H_2O$: C, 58.53; H, 6.07; N, 16.06. Found: C, 58.94; H, 6.02; N, 15.99.

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