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SYNTHESIS OF SOME NEW SULPHONANILIDES

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Condensation of various *ortho* substituted anilines (Ia-f) with methyl sulphonyl chloride gave *o*-substituted disulphonyl anilides (IIa-f). Cautious hydrolysis of the disulphonyl dervivatives gave the corresponding ortho-substituted sulphonylanilides (IIIa-f). The structure of the anilides has been confirmed through infrared spectroscopy and elemental analysis. These *o*-nitrosulphonanilides did not undergo base catalysed cyclisation to the expected novel heterocyclic N – oxides.

INTRODUCTION

Cyclisation of aromatic nitro compounds possessing *ortho* side chain to various nitrogen containing heterocyclic systems has been a method of fairly wide application. Thus, for example, cyclisation of *o*-nitrophenylurea derivatives to benzotriazine-l-oxide [1,2] and *o*-nitrophenylhydrazine to l-hydroxybenzotriazoles [3] can be very readily achieved. Similarly quinolines, indoles and benzimidazoles can be synthesised [4] by the cyclisation of appropriate aromatic nitro-compounds possessing side chains in the *ortho* position which could attack the nitro group in a nucleophilic manner. Although *o*-nitroacetanilide itself does not cyclise [5], yet ∝-acyl [6] or ∝-aryl-*o*-nitroacetanilides [7] are readily cyclised to corresponding 2-acyl-3-hydroxyquinoxaline-l-oxides. The major structural feature necessary for cyclisation appears to be the presence of electron withdrawing groups on the methylene group of *o*-nitro acetanilides to generate a carbanion which could then attack the nitro group in a nucleophilic manner. Accordingly the facile cyclisation of a number of ∝-cyano-orthonitroacetanilides has been reported [8].

It was thought desirable to extend the scope of this reaction further and a variety of substituted methyl sulphonanilides were prepared. The presence of strongly electron withdrawing sulphoxide group may sufficiently activate the methyl group for attack on the nitro group in the *ortho* position resulting in the synthesis of a novel heterocyclic system containing sulphur. The present communication describes the preparation and properties of a number of such hitherto unknown *o*-nitro methylsulphonanilides.

DISCUSSION

The reaction of *o*-nitroaniline (Ia) with methysulphonyl-chloride in pyridine afforded a facile synthesis of the *o*-nitro-N, N-dimethylsulphonanlide (IIa) which was characterised as the disulphonanilide on the basis of elemental analysis and infrared spectroscopy. The infrared spectrum of (IIa) indicated the absence of characteristic frequency due to amino group around 3500 cm^{-1}. This compound also showed the characteristic stretching frequency due to the nitro group at 1540 cm^{-1} and sulphonyl group at 1150 cm^{-1}.

The disulphonanilide derivative (IIa) on cautious hydrolysis with potassium hydroxide in pyridine afforded the desired monosulphonyl derivative (IIIa) in a crystalline form. The structure of (IIIa) was established on the basis of elemental analysis and infrared spectrosocopy. The product showed the presence of amino group (N-H), together with nitro and sulphonyl groups. The monosulfonyl derivative (IIIa) did not give the expected desired cyclisation product on treatment with a strong base and attempts to cyclise the *o*-nitro-sulphonylanilide failed, and the starting material was quantitatively recovered in all cases.

The failure of cyclisation of the monosulphonyl derivative indicated that the sulphonyl group itself is unable to exert a strong electron withdrawing influence to activate the methyl group and therefore a number of methylsulphonyl derivatives of substituted *ortho* nitroanilines were prepared and attempts were made to cyclise them. In this connection the reaction of 4-methyl-2-nitroaniline with methylsulphonyl chloride gave the disulpnonyl derivative (IIb) from which on hydrolysis the monosulphonylanilide (IIIb) was obtained. Similarly prepared were 4-methoxy and 4-ethoxy *o*-nitro disulphonyl-anilides (IIc) and (IId) which on hydrolysis afforded the monosulphonyl anilides (IIIc) and (IIId) respectively. The di-and monosulphonyl derivative of 4-chloro and 4-nitro-orthonitroanilides (IIe and IIf) and (IIIe, IIIf) were also prepared in very high yields. The structure of all these compounds was assigned on the basis of their I.R. Spectra and elemental analysis, the relevant data are given in Table 1. However *o*-nitro methylsulphonyl anilides did not show any tendency to cyclise when treated with a strong base and the substitutent groups in the anilides did not favour cyclisation. It appears that the electron withdrawing power of a sulphonyl group is not strong enough to activate the methyl group so that cyclisation by nucleophilic attack on the adjacent nitro group can take place.

EXPERIMENTAL

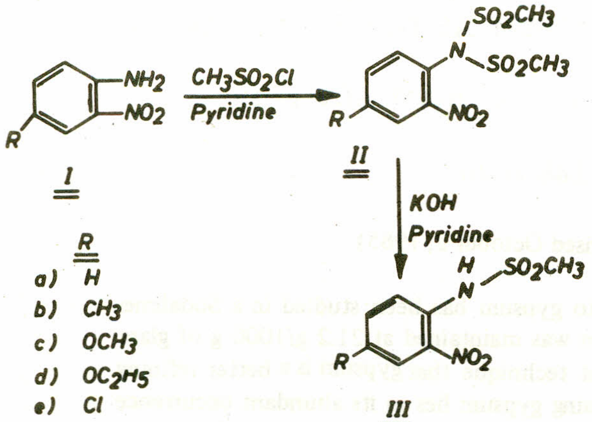
Infrared spectra were measured as Nujol mulls on Perkin Elmer 237 grating spectrophotometer fitted with NaCl optics. Melting points are uncorrected. Microanalysis were performed by Wellcome Research Laboratories, Kent (UK).

Preparation of 2-Nitro-N, N-dimethylsulphonanilides (IIa – IIf). The respective *o*-nitroaniline (Ia-If) (10g, 0.027 mol) was dissolved in dry pyridine and methylsulphonyl chloride (16.0g, 0.144 mole) was added slowly with continueous stirring. The mixture was stirred for 1 hr and left overnight at room temperature. It was poured into ice; the precipitate was filtered and washed with water (2x20 ml). The residue was extracted with cold and hot ether to remove traces of pyridine. The solid on recrystallisation from appropriate solvent (Table I) gave the respective disulphonanilides (IIa-IIf).

Table 1

Sr. No	Compound	Yield (%) p	Melting point (°C) (solvent)	IR –Nujol			Molecular formula	Elemental analysis Found %			Requires %		
				VN-H cm–;1	VNO_2 cm^{-2}	VSO_2 cm^{-1}		C	H	S	C	H	S
1.	IIa	85	185–186 (ethanol)	–	1540	1150	$C_8H_{10}N_2O_6S_2$	32.57	3.41	21.4	32.56	3.40	20.7
2.	IIIa	82	102–104 (ethanol)	3350	1540	1150	$C_7H_8N_2O_4S$	39.05	3.95	14.65	38.88	3.73	14.81
3.	IIb	91	199–200 (ethanol)	–	1540	1155	$C_9H_{12}N_2O_6S_2$	34.87	3.92	–	35.06	3.98	–
4.	IIIb	74	110–111 (ethanol)	3340	1542	1155	$C_8H_{10}N_2O_4S$	41.28	4.22	–	41.33	4.34	–
5.	IIc	86	171–172 (ethanol)	–	1535	1150	$C_9H_{12}N_2O_7S_2$	33.38	3.62	19.32	33.33	3.70	19.75
6.	IIIc	84	123–124 (ethanol)	3350	1550	1150	$C_8H_{10}N_2O_5S$	38.89	4.15	–	39.03	4.89	–
7.	IId	87	137–138 (ethanol)	–	1540	1152	$C_{10}H_{14}N_2O_7S_2$	35.59	4.05	18.55	35.50	4.14	18.53
8.	IIId	69	97–98 (ethanol)	3350	1545	1150	$C_9H_{12}N_2O_5S$	41.73	4.71	–	41.53	4.61	–
9.	IIe	97	184–185 (glacial acetic acid)	–	1545	1150	$C_8H_9N_2O_6S_2Cl$	28.40	2.63	19.32	28.25	2.47	19.48
10.	IIIe	87	138–139 (ethanol)	3300	1545	1150	$C_7H_7N_2O_4S\,Cl$	33.39	2.65	12.59	33.5	2.79	12.77
11.	IIf	85	208–209 (glacial acetic acid)	–	1545	1150	$C_8H_9N_3O_8S_2$	28.45	2.66	–	28.31	2.65	–
12.	IIIf	78	176 (ethanol)										

Preparation of 2-Nitro-N-methylsulphonanilides (IIIa-IIIf). The disulphonanilides (IIa-IIf) (3.0g) were dissolved in pyridine and to it was added 20% aqueous solution of potassium hydroxide (36 ml). Heat was evolved after the reaction mixture attained ambient temperature. Water (60 ml) was added and the clear reaction mixture was left overnight. It was subsequently poured over ice and then neutralised with acid. The solid obtained was washed with water and recystallised with an appropriate solvent to afford the respective methylsulphonanilides (IIIa-IIIf), Table 1.



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