A Facile Synthesis of some Pyrazolo[1,5-*b*]-1,2,4-benzothiadiazepin 5(4*H*)ones 10,10-Dioxides. A New Ring System

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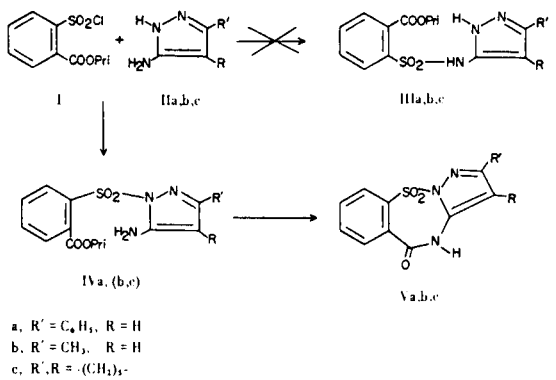
Received June 9, 1977

Isopropyl-2-chlorosulfonylbenzoate was treated with some 3(5)aminopyrazoles. A new ring system, pyrazolo[1,5-*b*]-1,2,4-benzothiadiazepin-5(4*H*)one 10,10-dioxide, was directly obtained.

J. Heterocyclic Chem., 14, 1431 (1977)

Recently one of us proved that 2-nitrobenzenesulfonyl chloride easily condensed with 3(5)aminopyrazoles through a preferential electrophilic attack at only the endocyclic nitrogen atom of the cyclic amidine, to give *N*-(2-nitrobenzenesulfonyl)-5-aminopyrazoles (1). In the present communication we wish to report the preliminary investigation of the reactivity of isopropyl-2-chlorosulfonylbenzoate (I) toward 3(5)aminopyrazoles (IIa,b,c), with a view to obtain the necessary intermediates IVa,b,c for the synthesis of the desired tricyclic system of type Va,b,c.



a, R′ = C_6H_5, R = H
b, R′ = CH_3, R = H
c, R′,R = $-(CH_2)_5-$

When an equimolar mixture of I and IIa was refluxed in dry benzene in the presence of triethylamine for 3 hours, a product was obtained in good yield. The structure of 5-amino-3-phenyl-1-(2-isopropoxycarbonylbenzenesulfonyl)pyrazole (IVa) was established by microanalysis and spectroscopic data. The ir spectrum showed bands at 3320 and 3490 cm^{-1} attributable to an NH_2 group; the pmr spectrum exhibited a singlet at 5.00 δ (2H), exchangeable with deuterium oxide, unequivocally due to an amino group. Simple refluxing of IVa in benzene, for an additional five hours, led to successful ring closure to give a product formulated as 2-phenylpyrazolo[1,5-*b*]-1,2,4-benzothiadiazepin-5(4*H*)one 10,10-dioxide. The structure proposed was assigned on the basis of elemental and spectroscopic data. The ir spectrum (nujol) showed absorption bands at 3200-3300 cm^{-1} (NH) and at 1730 (CO); the presence in the pmr spectrum (DMSO-d_6) of a singlet at 13.80 δ (1H) showed the presence of a mobile proton attributable to the NH of a cyclic amide structure.

When I was refluxed with IIb,c in the above mentioned experimental conditions to obtain IVa, none of the intermediates aminoderivatives could be herein isolated, but white high melting products were obtained, which we believe to be the tricyclic system Vb,c on the basis of elemental and spectroscopic data described in the Table.

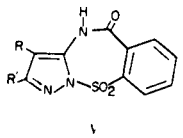
Further study in this area is in progress.

EXPERIMENTAL

All melting points were taken on a Buchi-Tottoli capillary melting point apparatus and are uncorrected; ir (nujol mull) were

Table

Pyrazolo[1,5-*b*]-1,2,4-benzothiadiazepin-5(4*H*)one 10,10-Dioxides



V

	R′	R	M.p., °C	Formula	Analysis Calcd. C	H	N	Found C	H	N
Va	C_6H_5	H	260-262	$C_{16}H_{11}N_3O_3S$ (a)	59.08	3.41	12.92	59.15	3.41	12.96
Vb	CH_3	H	258-260	$C_{11}H_9N_3O_3S$ (b)	50.19	3.45	15.97	50.28	3.54	16.12
Vc	$-(CH_2)_5-$		262-264	$C_{15}H_{15}N_3O_3S$ (c)	56.78	4.77	13.24	56.75	4.71	13.26

(a) Ir, cm^{-1}: 3200-3300 (broad, NH), 1730 (CO); pmr, δ: 6.84 (1H, s, pyrazole CH), 7.20-8.50 (10H, m, C_6H_5 and C_6H_4), 13.80 (1H, s, NH). (b) Ir, cm^{-1}: 3300 (NH), 1740 (CO); pmr, δ: 2.30 (3H, s, CH_3), 6.30 (1H, pyrazole CH), 8.00-8.50 (4H, m, C_6H_4), 12.90 (1H, s, NH). (c) Ir, cm^{-1}: 3200-3580 (broad, NH), 1740 (CO); pmr, δ: 1.50-3.00 (10H, m, $(CH_2)_5$), 8.00-8.50 (4H, m, C_6H_4), 13.00 (1H, broad, NH).

determined with a Perkin-Elmer Infracord 137 spectrophotometer; pmr (DMSO-d_6, unless otherwise specified) were obtained with a Jeol C-60 spectrometer (TMS as internal reference).

General Procedure for Pyrazolobenzothiadiazepinones (Va,b,c).

To a refluxed solution of IIa (2), b (3) and c (4) (10 mmoles) dissolved in dry benzene (200 ml.), isopropyl-2-chlorosulfonyl benzoate (I) (5) (10 mmoles) was added. Triethylamine (10 mmoles) was added by three equal portions over a period of 3 hours. After refluxing for an additional five hours, the solution was washed with water (2 x 100 ml.) and the organic layer was dried (sodium sulfate) and evaporated under reduced pressure. The residue was recrystallized from ethanol to yield 50-60% of the desired product Va,b,c, which are listed in the Table.

5-Amino-3-phenyl-1-(2-isopropoxycarbonylbenzenesulfonyl)pyrazole (IVa).

The title compound was isolated by the general procedure for the pyrazolobenzothiadiazepinones, but it was refluxed for 3 hours only, m.p. 127-130° (ethanol); ir, cm^{-1}: 3320 and 3490 (NH_2); pmr, (deuteriochloroform), δ: 1.42 (6H, d, J = ~5.0 Hz, 2 x CH_3), 5.00 (2H, s, NH_2), 5.36 (1H, heptet, J = ~5.0 Hz, isopropyl CH), 5.78 (1H, s, pyrazole CH), 7.20-8.00 (9H, m, C_6H_5 and C_6H_4).

Anal. Calcd. for $C_{19}H_{19}N_3O_4S$: C, 59.21; H, 4.97; N, 10.90. Found: C, 59.18; H, 5.00; N, 10.90.

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