

BASE CATALYSED REACTION OF 2-CYANOMETHYL-1,3-BENZOTHAZOLE
WITH BENZOFUROXANES

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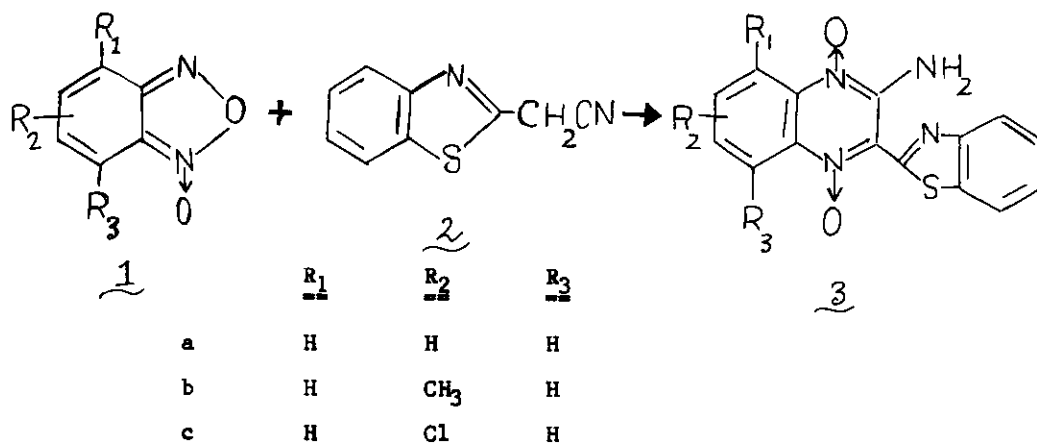
Abstract - 2-Cyanomethyl-1,3-benzothiazole (2) reacts with benzofuroxanes (1) to give quinoxaline N,N'-dioxides (3) in good yields.

Organic N-oxides are an attractive class of compounds and in particular quinoxaline-N,N'-dioxides are of significant biological importance. The versatile and fairly general procedure for the production of large number of N-oxides is reaction of benzofuroxanes with enamines which is quite often referred as Beirut reaction¹⁻³. Dienamines have also been reported to react with benzofuroxanes, yielding quinoxaline N,N'-dioxides^{4,5}. From this class of compounds Carbadox and Mecadox⁶ are in clinical practice. In continuation of our studies on benzofuroxanes^{7,8}, herein we report the formation of quinoxaline N,N'-dioxide by the reaction of 2-cyanomethyl-1,3-benzothiazole with benzofuroxanes.

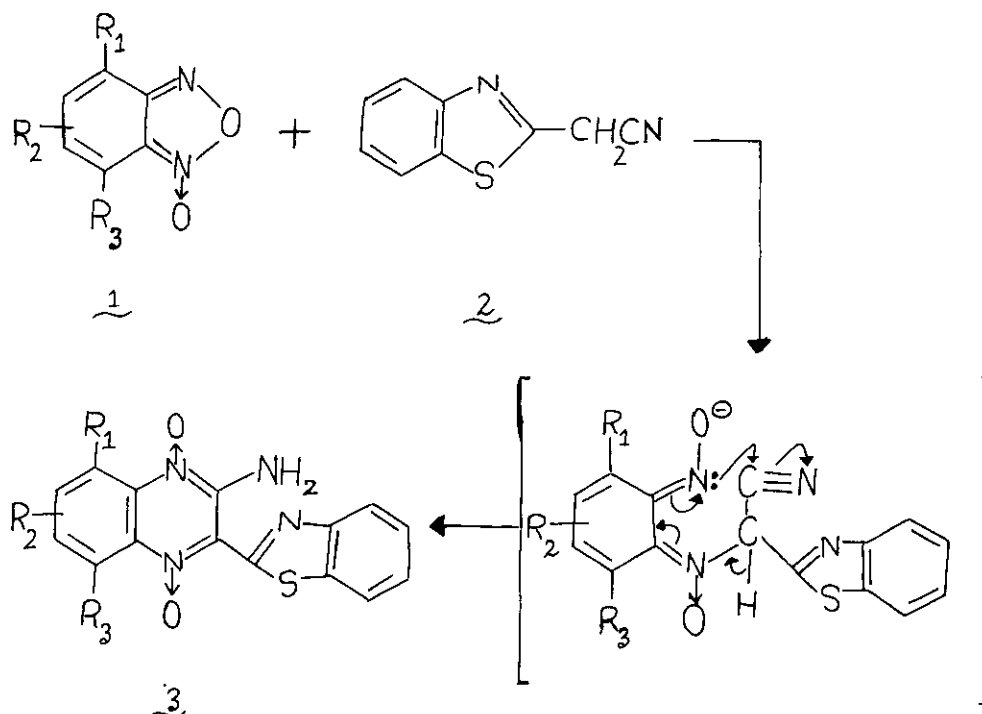
When reacted benzofuroxane (1a) and 2-cyanomethyl-1,3-benzothiazole (2) in equimolar quantities in ethanol at room temperature in presence of potassium carbonate gave bright red crystalline compound (3a) crystallisable from methanol, mp 240°C (dec.), in 80% yield. The structure of (3a) is fully corroborated by its spectral and elemental analysis, δ_{max} (KBr) 1348, 1355 (N→O), 3290, 3345, (NH₂) cm⁻¹. ¹H NMR (DMSO-d₆) δ : 7.44-8.56 (m, 10H), and m/z 310 (M⁺). Anal. Calcd. for C₁₅H₁₀N₄SO₂ : C, 58.06 ; H, 3.23 ; N, 18.06. Found : C, 58.55 ; H, 3.36 ; N, 18.05.

Similarly the reaction of (1b) and (1c) with (2) provided (3b) and (3c) in 72% and 82% yields respectively. (3b) δ_{max} (KBr) 1345, 1355 (N→O) 3290, 3330 (NH₂) cm⁻¹, m/z 324 (M⁺) and ¹H NMR (DMSO-d₆) δ : 2.55 (s, 3H),

7.55-8.40 (m, 9H) ; (3c) ν_{\max} (KBr) 1340, 1355 (N \rightarrow O), 3290, 3340 (NH₂) cm⁻¹. m/z 345 (M⁺) and ¹H NMR (DMSO-d₆) δ : 7.50-8.60 (m, 9H).



Concerning the mechanism of this reaction, a plausible reaction scheme is given below ;



Scheme - 1

EXPERIMENTAL

Melting points were obtained in open capillaries on a Büchi apparatus and are uncorrected. The ir spectra were measured on a Perkin-Elmer 237B spectrophotometer for potassium bromide discs. The mass spectra were determined on a AEIMS 30 instrument. The nmr spectra were recorded on Varian 220 MHz spectrometer.

Benzofuroxane was prepared by the oxidation of o-nitroaniline with sodium hypochlorite solution⁹. 5(6)-Methyl and 5(6)-chloro-substituted benzofuroxanes were prepared by pyrolysis of the corresponding nitrophenylazides¹⁰. 2-Cyanomethyl-1,3-benzothiazole was obtained by the reaction of 2-aminobenzenethiol with malononitrile as reported earlier¹¹.

Preparation of 3a

Equimolar quantities of benzofuroxane(1a) (1.36 g, 10 mmol) and 2-cyanomethyl-1,3-benzothiazole(2) (1.74 g, 10 mmol) were dissolved in ethanol in the presence of catalytic amount of K_2CO_3 . This reaction mixture was stirred magnetically till the solution turned to red colour in about 30 min. The reaction was followed by tlc and completion of reaction was concluded from the disappearance of benzofuroxane spot. The red crystals precipitated were filtered and were recrystallised from methanol (2.5 g, 80%) ; mp 240°C (dec.) ; ms m/z : 310 (M^+) ; ir $\int_{max}^{(KBr)} cm^{-1}$: 1348, 1355 ($N \rightarrow O$), 3290, 3345 (NH_2) ; 1H NMR ($DMSO-d_6$) δ : 7.44-8.56 (m, 10H) ; Anal. Calcd. for $C_{15}H_{10}N_4SO_2$: C, 58.06 ; H, 3.23 ; N, 18.06. Found : C, 58.55, H, 3.36 ; N, 18.05.

Preparation of 3b

In a similar experiment as above and workup(3b) was obtained in (2.3 g, 72%) ; mp 220°C (dec.) ; ms m/z : 324 (M^+) ; ir $\int_{max}^{(KBr)} cm^{-1}$: 1345, 1355 ($N \rightarrow O$), 3290, 3330 (NH_2) ; 1H NMR ($DMSO-d_6$) δ : 2.55 (s, 3H), 7.55-8.40 (m, 9H). Anal. Calcd. for $C_{16}H_{12}N_4SO_2$: C, 59.26 ; H, 3.70 ; N, 17.28. Found : C, 59.30 ; H, 3.76 ; N, 17.30.

Preparation of 3c

The N-oxide(3c) was obtained following the procedure as in given for(3a) in (2.8 g, 82%) ; mp 254°C (dec.) ; ms m/z : 345 (M^+) ; ir $\int_{max}^{(KBr)} cm^{-1}$: 1340, 1355 ($N \rightarrow O$), 3290, 3340 (NH_2) ; 1H NMR ($DMSO-d_6$) δ : 7.50-8.60 (m, 9H). Anal. Calcd. for $C_{15}H_9N_4SO_2Cl$: C, 52.25 ; H, 2.61 ; N, 16.26 Found : C, 52.31 ; H, 2.65 ; N, 16.51.

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