Asian Journal of Chemistry Vol. 14, No. 1 (2002), 548–550

NOTE

Synthesis and Dehydrogenation of Isoxazolines by Using $DMSO\text{-}I_2\text{-}H_2SO_4$ and $DMSO\text{-}I_2$ System

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4′-Chlorochalcone (**Ia**), 4′-chloro-4-methoxychalcone (**Ib**), 4′-nitrochalcone (**Ic**) and 4′-nitro-4-methoxychalcone (**Id**) have been condensed with hydroxylamine hydrochloride to yield isoxazolines (**IIa–d**). Isoxazolines (**IIa–d**) have been suspended in DMSO and crystals of iodine to yield isoxazoles (**IIIa–d**).

Key words: Synthesis, dehydrogenation, isoxazoline, $DMSO\text{-}I_2\text{-}H_2SO_4$, $DMSO\text{-}I_2$ system.

Isoxazolines have been reported to be active fungicides and insecticides[1]. These compounds owe their activities to the heterocyclic ring present in the structure[2–4]. The reaction is not simple. Products like hydroxylamine ketone, hydroxylamino oxime, disubstituted hydroxylamine, etc. may be formed depending upon the nature of substituents and proportion of reactants[5–7]. *o*-Hydroxychalcone and corresponding flavanones on treatment with hydroxylamine hydrochloride in pyridine medium yield isoxazoline[8].

Literature survey indicates that isoxazolines were prepared from 2-hydroxychalcone. Hence it was thought to prepare isoxazoline from 4,4′-substituted chalcone. Flavones have been dehydrogenated into flavonones by $DMSO_4\text{-}I_2\text{-}H_2SO_4$ system[9] and $DMSO\text{-}I_2$.[10] Recently we reported dehydrogenation of pyrazolines and their derivatives using $DMSO\text{-}I_2\text{-}H_2SO_4$ and $DMSO\text{-}I_2$ system[11, 12]. In view of the above observation we report here the use of $DMSO\text{-}I_2\text{-}H_2SO_4$ and $DMSO\text{-}I_2$ system for the preparation of isoxazoles.

Synthesis of 3-(4″-chlorophenyl)-5-phenylisoxazoline (IIa):

A mixture of 4′-chlorochalcone (**Ia**) (0.01 mole), hydroxylamine hydrochloride (0.02 mole) and aq. KOH (0.3 g in 2 mL) was refluxed in ethanol (30 mL) for about 2 to 3 h. The reaction mixture was cooled and acidified by 1 : 1 HCl in ice-cold condition. The solid separated out was crystallised from ethanol to give compound (**IIa**), m.p. 109°C, yield 76%.

Properties and constitution of the compound (IIa)

It is a pale yellow crystalline solid, m.p. 109°C. From analytical data its m.f.

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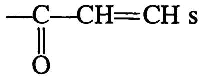
was found to be $C_{15}H_{12}NOCl$ and molecular weight 257.5. The R_f values in benzene was found to be 0.70 on silica gel-G plate with layer thickness of 0.3 mm. It gives yellow coloration[13] with concentrated H_2SO_4, indicating the presence of isoxazoline nucleus and absence of  $-\underset{\underset{O}{\|}}{C}-CH{=}CH$ system. IR spectrum of the compound was recorded in Nujol: 2894 (—CH-stretching), 1593 (—C=N stretching), 1466 (—CH_2 stretching), 754 cm^{-1} (C—Cl stretching). PMR ($CDCl_3$): 3.25 (dd; 1H; > CHH_A); 3.68 (dd, 1H, >CH_BH), 5.7 (dd, 1H, > CH_x), 6.4 to 8 δ (m, 9H, Ar—H).

The same isoxazoline is prepared by another method.

A mixture of 4′-chlorochalcone (Ia) (0.01 mole) and hydroxylamine hydrochloride (0.012 mole) was refluxed in 20 mL pyridine for 4 h. The reaction mixture was cooled, diluted with water and acidified with 1 : 1 HCl. The solid separated out was crystallised from ethanol to give compound **(IIa)**, m.p. 109°C, yield 74%.

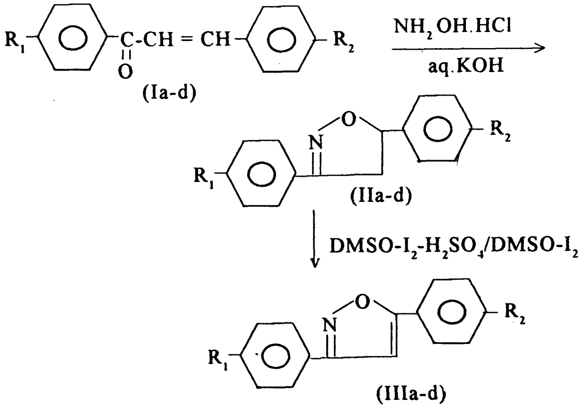
Synthesis of 3-(4″-chlorophenyl)-5-phenyl isoxazole (IIIa)

3-(4″-Chlorophenyl)-5-phenyl isoxazoline **(IIa)** (0.01 mole) was suspended in DMSO (30 mL) and crystals of iodine were added to it. The reaction mixture was refluxed for about 1 h; cooled, diluted with water, washed with 20% aq. sodium thiosulphate and crystallised from ethanol to give **(IIIa)**, m.p. 172°C, yield 70%.

Properties and constitution of compound (IIIa)

It is a white crystalline solid, m.p. 172°C. From analytical data the m.f. was found to be $C_{15}H_{10}NOCl$ and molecular weight 255.5. The R_f valus in benzene was found to be 0.73 on silica gel-G plate with layer thickness of 0.3 mm. IR spectrum of the compound was recorded in Nujol and showed the following absorptions: 3053 (—CH stretching), 1612 (—C=C stretching), 1600 (—C=N stretching), 767 cm^{-1} (C—Cl stretching). PMR ($CDCl_3$): 6.8 to 7.8 δ (m, 10H, Ar—H and heteroaromatic H).

The above experiment was carried out by adding 2–3 drops of concentrated H_2SO_4; it also gave the same product. The other isoxazolines and isoxazoles were prepared by the same method.



The synthesised isoxazolines and isoxazoles are listed in Table 1.

TABLE-1
CHALCONES, ISOXAZOLINES AND CORRESPONDING ISOXAZOLES

Compd. No.	R_1	R_2	m.f.	m.w.	m.p. (°C)	Yield (%)	R_f (benzene)
Ia	—Cl	—H	$C_{15}H_{11}ClO$	242.5	95	76	0.76
Ib	—Cl	—OCH_3	$C_{16}H_{13}ClO_2$	272.5	113	80	0.74
Ic	—NO_2	—H	$C_{15}H_{11}NO_3$	253.0	117	72	0.92
Id	—NO_2	—OCH3	$C_{16}H_{13}NO_4$	283.0	175	78	0.87
IIa	—Cl	—H	$C_{15}H_{12}NOCl$	257.5	109	76	0.70
IIb	—Cl	—OCH_3	$C_{16}H_{14}NO_2Cl$	287.5	105	90	0.65
IIc	—NO_2	—H	$C_{15}H_{12}N_2O_3$	268.0	61	72	0.89
IId	—NO_2	—OCH3	$C_{16}H_{14}N_2O_4$	298.0	75	88	0.82
IIIa	—Cl	—H	$C_{15}H_{10}NOCl$	255.5	172	72	0.73
IIIb	—Cl	—OCH_3	$C_{16}H_{12}NO_2Cl$	285.5	188	88	0.84
IIIc	—NO_2	—H	$C_{15}H_{10}N_2O_3$	266.0	210	70	0.78
IIId	—NO_2	—OCH3	$C_{16}H_{12}N_2O_4$	296.0	217	80	0.88

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(*Received*: 13 September 2001; *Accepted*: 23 November 2001) AJC-2548