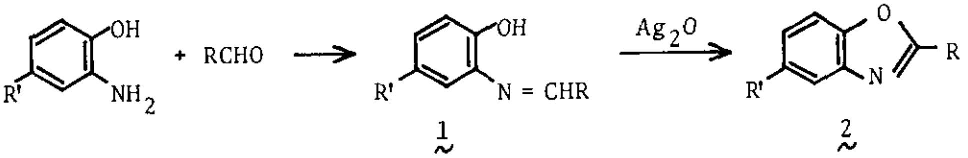
HETEROCYCLES, Vol. 10, 1978

PREPARATION OF BENZOXAZOLES FROM N-ALKYLIDENE-2-HYDROXYANILINES AND SILVER OXIDE

Masaaki Yoshifuji, Rihei Nagase, Takayuki Kawashima,
and Naoki Inamoto*
Department of Chemistry, Faculty of Science,
The University of Tokyo, Hongo, Tokyo 113, Japan

Oxidation of N-alkylidene-2-hydroxyanilines with silver oxide gave 2-alkyl- or 2-arylbenzoxazoles in good yields under mild reaction conditions.

We have reported that α,N-diarylnitrones react in the presence of O-methyl diphenylphosphinothioate at 150°C to give 2-arylbenzoxazoles.[1] During the course of studies on the mechanism for formation of oxazoles, we have found that silver oxide[2] oxidizes N-alkylidene-2-hydroxyanilines(1) very efficiently under mild conditions to give the corresponding 2-substituted benzoxazoles (2) in good yields.



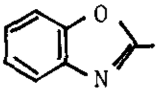
Schiff's bases (**1**) were prepared from the corresponding aldehydes and *o*-aminophenols. Condensations of aliphatic aldehydes with *o*-aminophenol were carried out at 0-10°C in the presence of anhydrous sodium sulfate in order to avoid side reactions.[3]

A typical procedure for oxidation reaction was as follows. A mixture of *N*-(*p*-methoxybenzylidene)-*o*-hydroxyaniline (228 mg, 1.00 mmol) and silver oxide (260 mg, 1.18 mmol) in 15 ml of dichloromethane was stirred at 25°C for 3 h. The reaction mixture was filtered through Celite and the filtrate was chromatographed over alumina. The solid thus obtained was recrystallized from ethanol to give 206 mg (92 %) of 2-*p*-methoxyphenylbenzoxazole (**2b**). Table shows the results of the oxidation reactions.

Benzoxazoles are usually prepared by heating *o*-aminophenols with acid anhydrides or acid halides.[4] It is also known that lead(IV) tetracetate,[5,6] lead(IV) phosphate,[7] and nickel peroxide[8] oxidize Schiff's bases to give benzoxazoles. To the best of our knowledge, yields in the present method were better and the reaction conditions employed were milder than any other methods for preparation of oxazoles. The present method was generally applicable to the preparation of 2-arylbenzoxazoles (**2a**-**2f**). Benzoxazoles **2g** and **2i** were prepared from furfural and glyoxal respectively.

Some 2-alkyl (**2j** and **2k**) or alkenyl (**2h**, **2l'**, and **2m**) substituted benzoxazoles were also prepared, although butanal did not give 2-propylbenzoxazole, but gave **2l**, because an aldol-type condensation occurred at first during the preparation of the

TABLE Preparation of Benzoxazoles (2) from Schiff's Bases (1)

	Oxazole		Yield	Mp	Lit. Mp (Bp)
	R	R'	(%)	(°C)	(°C, °C/Torr)
2a	C_6H_5	H	76[a]	103-105	102[5]
2b	p-$MeOC_6H_4$	H	92[a]	101-102	99[5]
2c	p-ClC_6H_4	H	81[a]	151-152	151-152[5]
2d	p-$O_2NC_6H_4$	H	80[a]	266.5-268	268[5]
2e	p-$MeOC_6H_4$	CH_3	70[a]	109-111	98-100[9]
2f	p-$MeOC_6H_4$	Cl	69[a]	155-156	150-152[9]
2g		H	45[b]	88-89	86-86.5[8]
2h	PhCH = CH-	H	87[a]	83-85	80-81.5[8]
2i		H	25[b]	262-263	255-257[10]
2j	Me_2CH	H	54[b]	c)	(109-111/10)[11]
2k	Me_3C	H	57[b]	c)	(124/17)[12]
2l[d]	PrCH = C(Et)-	H	37[b]	c)	
2l'	PrCH = C(Et)-	H	74[b]	c)	
2m	EtCH = C(Me)-	H	41[b]	c)	

a) Isolated yield based on the corresponding Schiff's base.

b) Isolated yield based on o-aminophenol.

c) Each liquid material obtained was purified by column chromatography (alumina) followed by bulb-to-bulb distillation and identified by comparing its nmr, ms, and elemental analysis with that of each authentic sample.

d) This compound was obtained in the reaction of o-aminophenol with butanal followed by silver oxide oxidation.

corresponding Schiff's base. 2-(1-Ethylpentenyl)- and 2-(1-methylbutenyl)benzoxazoles (**2l**' and **2m**) were prepared from the corresponding Schiff's bases which were prepared from *o*-aminophenol and aldols of butanal and propanal.

The ring closure mechanism of Schiff's bases with silver oxide might involve phenoxy radicals.

REFERENCES

1 R. Nagase, T. Kawashima, M. Yoshifuji, and N. Inamoto, *Heterocycles*, 1977, **8**, 243.

2 L. F. Fieser and M. Fieser, "Reagents for Organic Synthesis," Vol. 1, John Wiley, New York, 1967, p. 1011.

3 K. Harada and T. Okawara, *Bull. Chem. Soc. Jpn.*, 1973, **49**, 191.

4 R. M. Acheson, "An Introduction to the Chemistry of Heterocyclic Compounds," 3rd. Ed., John Wiley, New York, 1977, p. 353.

5 F. F. Stephens and J. D. Bower, *J. Chem. Soc.*, 1949, 2971.

6 F. F. Stephens and J. D. Bower, *J. Chem. Soc.*, 1950, 1722.

7 M. S. A. El-Meligy and S. A. Mohamed, *J. Prakt. Chem.*, 1974, **316**, 154.

8 K. Nakagawa, H. Onoue, and J. Sugita, *Chem. Pharm. Bull. (Tokyo)*, 1964, **12**, 1135.

9 E. Yu. Belyaev, L. E. Kondrat'eva, and N. A. Shakhov, *Khim. Geterotsikl. Soedin.*, 1972, 10.

10 S. Hünig, D. Scheutzow, H. Schlaf, and H. Quast, *Liebigs Ann. Chem.*, 1972, **765**, 110.

11 N. S. Kozlov and B. I. Kiselev, *Khim. Geterotsikl. Soedin.*, 1966, 345.

12 L. Oliveros, *Bull. Soc. Chim. Fr.*, 1974, 2628.

Received, 16th September, 1978