Tetrahedron Letters No.4, pp. 327-330, 1967. Pergamon Press Ltd. Printed in Great Britain.

ALIPHATIC CHLOROOXIMES AND THEIR APPLICATIONS IN THE SYNTHESIS OF ISOXAZOLE AND β-FURANONE SYSTEMS

G. Casnati and A. Ricca.

Istituto di Chimica del Politecnico

Milano (Italy).

(Received 31 October 1966; in revised form 18 November 1966)

In the wake of our previous researches[1] on the transformation of heterocycles we have found a practical method of synthesis of aliphatic chlorooximes[2], as source of the corresponding nitrile oxide.

Ether solutions of various oximes were cooled to about - 60°, then subjected to a slow chlorine stream for ten minutes: thus, white solid products separated, which were fairly stable in vacuum at low temperature (Table I).

The physical and chemical properties of the products obtained are consistent with the structures of chloronitroso-derivatives, in equilibrium with the corresponding dimers. The I.R. spectra of the solid products do not show hydroxyl bands, and solutions in the usual organic solvents present a characteristic blue colour, which fades, and disappears after about one hour.

The N.M.R. spectrum[3] of the product obtained from acetaldoxime both soon after dissolving and after 40 minutes in $CDCl_3$, shows the following signals:

immediate registration : two quartets (1 H) J = 6.5, 6.66-6.70δ($CH_3\underline{CH}$ of two different molecular species), D at 1.92δ(3 H), J = 6.5 ($\underline{CH_3}CH$).

after 40 minutes : 2 S 3.14δ(3 H) ($\underline{CH_3}$ of the syn and anti forms), S 11.43δ(1 H) (OH).

The above suggests that, by analogy with the nitroso-compounds of similar structure[4], a dimer exists in solution in equilibrium with the monomer which isomerizes to chlorooxime with time[5] :

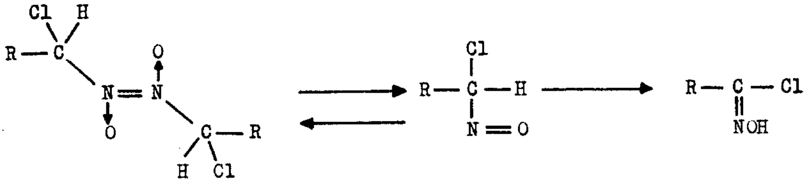
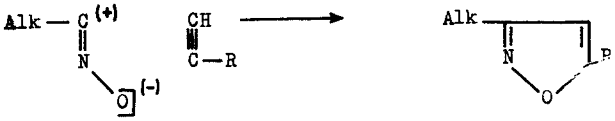


Table I - Chloro derivatives

RCH = NOH R =	m.p.	Yield(x) %
CH_3	73°	87
C_2H_5	60°	78
n.C_3H_7	50°	64
i.C_3H_7	45°	60
n.C_4H_9	~30°	90
i.C_4H_9	-	95
n.C_5H_{11}	-	80

(x) the yield is calculated as chlorooxime

The products exhibit chemical properties similar to those of the known chlorooximes: in particular, in a basic medium and in the presence of triple bonds, they give 1,3-dipolar additions, forming 3-alkylisoxazoles[6] (Table II):



R = $-C_6H_5$, $-CH_2OH$, $-COOH$

Table II

Alkyl	$R = C_6H_5$ -		$R = CH_2OH$		R = COOH (7)	
	m.p., b.p.	Yield%	b.p.	Yield%	m.p.	U.V.(EtOH) λmax.(logε)
CH_3	67°	59	130° (20 mm)	—	211°	224 (3.96)
C_2H_5	—	—	100-105(0.4)	55	122°	225 (3.94)
$n.C_3H_7$	150-160°(0.3)	47	100-110(0.5)	69	117°	225 (3.94)
$i.C_3H_7$	145-150°(0.3)	37	150° (0.2)	60	75°	224 (3.98)
$n.C_4H_9$	—	—	130° (0.4)	88	151°	225 (3.96)
$n.C_5H_{11}$	160°(0.3)	45	130° (0.3)	66	120°	224 (4.00)

The formation of aliphatic chlorooximes offers new synthetic possibilities to some trasformations recently achieved[1b] by us leading to the formation,from 3-alkyl-5-hydroxymethylisoxazoles,of the corresponding 5-alkyl-2,3-dihydrofuran-3-ones :

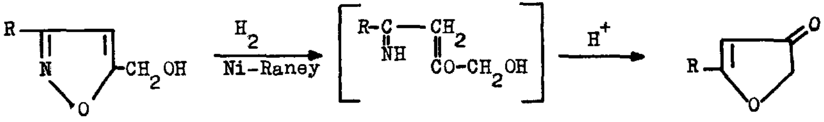


Table III

R	b.p.	U.V.(EtOH) max.(logε)	I.R.(cm^{-1})	yield%
C_2H_5	140-150° (0.2)	260 (4,03)	1700 1600	73
$n.C_3H_7$	110-120° (0.3)	260 (4.10)	"	70
$i.C_3H_7$	100-120° (0.3)	260 (4.11)	"	74
$i.C_4H_9$	120° (0.3)	260 (4.11)	"	80
$n.C_5H_{11}$	130° (0.3)	260 (4.07)	"	61

5-alkyl-2,3-dihydrofuran-3-ones have recently been extensively studied, but up to the present they have been difficult to prepare[8];in our cases, all 5-hydroxymethylisoxazoles underwent trasformation into dihydrofuranones in good yields (Table III).

REFERENCES

1) (a)G.Casnati,A.Quilico,A.Ricca and P.Vita Finzi,La Chimica e l'Industria 47,993 (1965);(b) Tetrahedron Letters 233,(1966),Gazz.Chim.It. 96,1073 (1966).

2) O.Piloty and H.Steinbock,Ber.35,3113 (1902); H.Wieland,Ber.40,1670 (1907); G.Zinner and M.Gunther,Angew.Chem.Int.Ed. 3,383 (1964).

3) The chemical shifts are measured in ppm (δ)from TMS as internal standard.

4) J.P.Freemann,J.Org.Chem. 28,2508 (1963).

5) J.Armand,Bull.Soc.Chim.France 882 (1966).

6) P.Vita Finzi and P.Grunanger,La Chimica e l'Industria 47,517 (1965).

7) The same acids are also obtained by oxidation of the corresponding isoxazole carbinols with 60 - 90 % yields.

8) R.E.Rosenkranz,R.Allner,R.Good,W.v.Philipsborn and C.H.Eugster 46, 1259 (1963); A.Hoffmann,W.v.Philipsborn and C.H.Eugster,ibidem 48, 1322 (1965).