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REACTIONS WITH 4-SUBSTITUTED ISOXAZOLIN-5-ONES—II*

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Abstract—The exocyclic double bond in 4-arylidene-3-substituted-isoxazolin-5-ones (I) undergoes addition reactions with Grignard reagents and with benzene in the presence of aluminium chloride. Treatment of 4-arylazo derivatives of 3-substituted-isoxazolin-5-ones (III) with Grignard reagents does not effect hetero-ring opening and only the carbonyl group of III enters into reaction, followed by elimination of the elements of water on acidification, yielding 3-substituted-4-arylazo-5-arylisoxazoles (IV). Deacylation of 4-acetyl-3-phenylisoxazoline-5-one (VI) is achieved by the action of organomagnesium compounds, magnesium-magnesium iodide mixture, and/or lithium aluminium hydride.

3,4-Disubstituted-5-methoxyisoxazoles (X) are readily obtained upon treatment of II with diazomethane. 2-Methyl-3,4-disubstituted-isoxazolin-5-ones (XI) are produced via the action of methyl iodide on the silver salt of II and/or via the action of dimethyl sulphate on IIa directly.

RECENTLY, it has been shown[1] that the exocyclic double bond in 4-arylidene-3-methylisoxazolin-5-ones (I, R = CH_3) undergoes addition reactions with Grignard reagents and with aromatic hydrocarbons in presence of aluminium chloride to give 4-disubstituted-3-methylisoxazolin-5-ones (II, R = CH_3). Since the isoxazolone ring is present in several active compounds,[2] this reaction with alkyl- and arylmagnesium halides has been developed and it has been shown that treatment of Ib–e with excess of Grignard reagents under varying conditions results in the formation of IIb–n.

The structure of these products (IIb–n) has been established as follows: (i) The formation of IIh both by the action of *p*-methoxyphenylmagnesium bromide on Ib and by the action of phenylmagnesium bromide on Id. (ii) The identity of the product obtained by the action of phenylmagnesium bromide on Ib with that obtained in the Friedel–Crafts reaction (see below). (iii) The presence of a strong carbonyl absorption, in the IR spectrum of IIb, which is split into two partially resolved bands at 1715–1680 cm^{-1}.[3]

The arylidene derivatives of 3-phenylisoxazolin-5-one (I) in the Friedel–Crafts reaction with benzene, in the case of Ib–d, result in the formation of 1,4-addition products (IIb, e, h), which are identical with products obtained in the Grignard reaction described.

The introduction of the electron-withdrawing group, namely the arylazo group, in the 4-position of 3-substituted-isoxazolin-5-ones increases the reactivity of the

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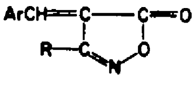
* For part I, cf. A. Mustafa, W. Asker, A. H. Harhash and N. A. L. Kassab, *Tetrahedron* **19**, 1577 (1963).

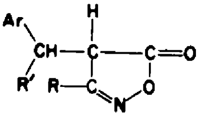
[1] A. Mustafa, W. Asker, A. H. Harhash and N. A. L. Kassab, *Tetrahedron* **19**, 1577 (1963).

[2] T. Urbański, C. Bełżecki, B. Chechelska, J. Chylińska, H. Dabrowska, J. Falecki, D. Grüne, L. Halski, S. Malinowski, B. S. Serafinowa, J. Żylowski, Š. Slopek, I. Kamieńska, J. Venulet, M. Janowiez, K. Jakimowska, A. Urbańska and A. Kuźniecow, *Gruźlica* **26**, 889 (1958); *Chem. Abstr.* **53**, 4567 (1959).

[3] A. J. Boulton and A. R. Katritzky, *Tetrahedron* **12**, 41 (1961).



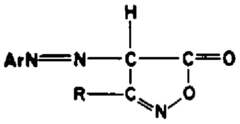
Ia, Ar = C_6H_5; R = CH_3
b, Ar = R = C_6H_5
c, Ar = C_6H_4Cl-p; R = C_6H_5
d, Ar = $C_6H_4OCH_3$-p; R = C_6H_5
e, Ar = $C_6H_3:O_2CH_2(3:4)$; R = C_6H_5



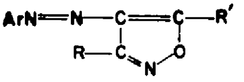
IIa, Ar = R′ = C_6H_5; R = CH_3
b, Ar = R = R′ = C_6H_5
c, Ar = R = C_6H_5; R′ = $C_6H_4CH_3$-p
d, Ar = R = C_6H_5; R′ = C_2H_5
e, Ar = C_6H_4Cl-p; R = R′ = C_6H_5
f, Ar = C_6H_4Cl-p; R = C_6H_5; R′ = $C_6H_4CH_3$-p
g, Ar = C_6H_4Cl-p; R = C_6H_5; R′ = C_2H_5
h, Ar = $C_6H_4OCH_3$-p; R = R′ = C_6H_5
i, Ar = $C_6H_4OCH_3$-p; R = C_6H_5; R′ = $C_6H_4CH_3$-p
j, Ar = $C_6H_4OCH_3$-p; R = C_6H_5; R′ = $CH_2C_6H_5$
k, Ar = $C_6H_4OCH_3$-p; R = C_6H_5; R′ = C_2H_5
l, Ar = $C_6H_3:O_2CH_2(3:4)$; R = R′ = C_6H_5
m, Ar = $C_6H_3:O_2CH_2(3:4)$; R = C_6H_5;
R′ = $C_6H_4CH_3$-p
n, Ar = $C_6H_3:O_2CH_2(3:4)$; R = C_6H_5; R′ = C_2H_5

carbonyl group toward the action of organomagnesium compounds. When the highly coloured 3-methyl (or phenyl)-4-arylazoisoxazolin-5-ones (IIIa–g) are treated with arylmagnesium halides, coloured products of 5-aryl-3-methyl (or phenyl)-4-arylazoisoxazoles (IVa–m) are obtained. The Grignard reagent adds to the carbonyl group of the heterocyclic system to give the intermediate V, which loses the elements of water on acidification. Grignard reagents react less readily with azo and imine bonds than with lactones. The stability of the isoxazolone ring in III toward the action of organomagnesium compounds simulates that of the pyrazolone ring in 4-arylazo-1-phenyl-3-methylpyrazolin-5-ones toward the same reagent.[4] Moreover, the reactivity of the carbonyl function in III parallels the reactivity of the same group in 4-phenylazo-2-phenyl-2-oxazolin-5-one[5] and 4-arylazo-1-phenyl-3-methylpyrazolin-5-ones.[4]

The structure assigned to the Grignard products IVa–m is inferred from: (i) the fact that they are coloured, (ii) the identity of Vi with 3,5-diphenyl-4-phenylazo-5-isoxazole, recently obtained by the interaction of benzeneazodibenzoylmethane with hydroxylamine,[6] (iii) the IR spectrum of IVi shows no carbonyl absorption.



IIIa, Ar = C_6H_5; R = CH_3
b, Ar = $C_6H_4CH_3$-o; R = CH_3
c, Ar = $C_6H_4CH_3$-p; R = CH_3
d, Ar = $C_{10}H_7$-1; R = CH_3
e, Ar = R = C_6H_5
f, Ar = $C_6H_4CH_3$-o; R = C_6H_5
g, Ar = $C_6H_4CH_3$-p; R = C_6H_5



IVa, Ar = R′ = C_6H_5; R = CH_3
b, Ar = C_6H_5; R = CH_3; R′ = $C_6H_4CH_3$-p
c, Ar = $C_6H_4CH_3$-o; R = CH_3; R′ = C_6H_5
d, Ar = $C_6H_4CH_3$-o; R = CH_3; R′ = $C_6H_4CH_3$-p
e, Ar = $C_6H_4CH_3$-p; R = CH_3; R′ = C_6H_5
f, Ar = R′ = $C_6H_4CH_3$-p; R = CH_3
g, Ar = $C_{10}H_7$-1; R = CH_3; R′ = C_6H_5
h, Ar = $C_{10}H_7$-1; R = CH_3; R′ = $C_6H_4CH_3$-p
i, Ar = R = R′ = C_6H_5
l, Ar = R = C_6H_5; R′ = $C_6H_4CH_3$-p
k, Ar = $C_6H_4CH_3$-o; R = R′ = C_6H_5
l, Ar = $C_6H_4CH_3$-o; R = C_6H_5; R′ = $C_6H_4CH_3$-p
m, Ar = $C_6H_4CH_3$-p; R = R′ = C_6H_5

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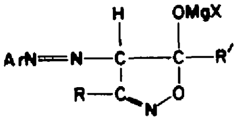
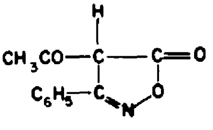
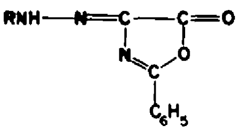
[4] A. Mustafa, W. Asker, A. F. A. Shalaby and Z. Selim, *J. Org. Chem.* **26**, 1779 (1961).
[5] W. Asker and Z. Elagroudi, *J. Org. Chem.* **26**, 1441 (1961).
[6] H. Garg, *J. Indian Chem. Soc.* **40**, 135 (1963).

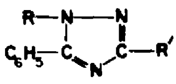

V


VI

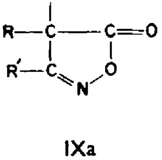
The effect of electron-withdrawing groups in the 4-position of 3-phenylisoxazolin-5-one on the stability of the hetero-ring is further illustrated in the case of 4-acetyl-3-phenylisoxazolin-5-one (VI) which with excess of Grignard reagents results in loss of the acyl group and formation of 3-phenylisoxazolin-5-one in good yield in every case. Similarly, treatment of VI with magnesium-magnesium iodide mixture and/or with lithium aluminium hydride results in deacylation.

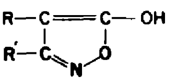
Reference should be made to the difference in behaviour of the hetero-ring in 2-phenyl-4-arylazo-2-oxazolin-5-ones (VII) and in III. Recently, heterocyclic ring opening, accompanied by rearrangement has been reported by treatment of VII with organometallic compounds, bases, and/or thiols to give the corresponding 1-aryl-5-phenyl-3-substituted-1H-1,2,4-triazoles (VIII).[5,7] Similarly, VI reacts with aqueous sodium hydroxide solution (50%) to yield 3-phenylisoxazole-4-carboxylic acid.[8] On the other hand, the heterocyclic ring in IIIa has now been found to be stable toward the action of sodium hydroxide (20%).

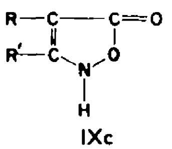

VII


VIII

Recently, the tautomerism of 5-isoxazolones has been discussed by Boulton and Katritzky[3] via the study of the UV and IR spectra and basicities of the possible tautomeric structures (IXa–c) and of their corresponding methylated derivatives. 5-Isoxazolones can be methylated by a variety of procedures to produce monomethyl derivatives of IXa–c, the structure of which seems to differ according to the alkylating agent. Thus, whereas the N-methyl derivatives (cf. IXc) could be obtained upon treatment of the silver or sodium salts of 3-phenylisoxazolin-5-one,[3,9] 3-phenyl-4-methylisoxazolin-5-one,[3] 3,4-diphenylisoxazolin-5-one[10] and 4-carbethoxyisoxazolin-5-one[11] with methyl iodide, it has been reported that 3,4-dimethyl-5-methoxyisoxazole


IXa


IXb


IXc

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[7] G. W. Sawdey, *J. Amer. Chem. Soc.* **79**, 1955 (1957).

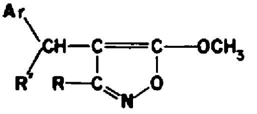
[8] F. Korte and K. Störiko, *Ber. Dtsch. Chem. Ges.* **94**, 1956 (1961); A. E. Hydron, F. A. McGinn, J. R. Moetz and J. Schwartz, *J. Org. Chem.* **27**, 4305 (1962).

[9] E. Oliveri-Mandala and A. Coppola, Atti reale acad. Lincei [5] 20, I, 248 (1911); Abstracts **100**, 492 (1911).

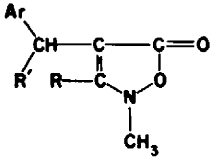
[10] E. P. Kohler and A. H. Blatt, *J. Amer. Chem. Soc.* **50**, 504 (1928).

[11] L. Claisen, *Ber. Dtsch. Chem. Ges.* **30**, 1480 (1897).

(cf. IXb) is obtained upon treatment of the neutral silver salt of 3,4-dimethylisoxazolin-5-one with methyl iodide.[3] On the other hand, the O-methyl derivatives are occasionally produced via the action of diazomethane on 5-isoxazolones;[3,9] reported examples of N-methyl formation via the action of diazomethane has been cited in the case of 3-phenyl-4-bromoisoxazolin-5-one and 3-phenyl-4-methylisoxazolin-5-one.[3] An investigation into the action of diazomethane on 3-substituted-4-diarylmethylisoxazolin-5-ones has revealed that when compounds IIa-c, e, h, i, e are treated with diazomethane, Xa–g are produced respectively. On the other hand, treatment of the neutral silver salt of IIa, b, e with methyl iodide yields the N-methyl derivatives (XIa–c). Compound XIa has also been obtained via the action of dimethyl sulphate on IIa according to the procedure described for the preparation of 2,3-dimethyl-1-phenyl-4-phenylazopyrazolin-5-one.[12]



Xa, Ar = R' = C_6H_5; R = CH_3
b, Ar = R = R' = C_6H_5
c, Ar = R = C_6H_5; R' = $C_6H_4CH_3$-p
d, Ar = C_6H_4Cl-p; R = R' = C_6H_5
e, Ar = $C_6H_4OCH_3$-p; R = R' = C_6H_5
f, Ar = $C_6H_4OCH_3$-p; R = C_6H_5; R' = $C_6H_4CH_3$-p
g, Ar = $C_6H_3{:}O_2CH_2(3{:}4)$; R = R' = C_6H_5



XIa, Ar = R' = C_6H_5; R = CH_3
b, Ar = R = R' = C_6H_5
c, Ar = C_6H_4Cl-p; R = R' = C_6H_5

The structure of the O-methyl derivatives (Xa–g) is inferred from: (i) the fact that their IR spectra show no carbonyl absorption, (ii) their insolubility in aqueous sodium hydroxide solution and their negative test with ferric chloride, in contrast to the behaviour of II, (iii) the stability of XIa toward the action of potassium hydroxide under the given experimental conditions.[13] The stability of Xa toward alkali is in contrast to the behaviour of the heterocyclic ring system in XIa which now has been found to undergo ring opening by the action of alcoholic potassium hydroxide to yield benzhydrylacetone; identified as its semicarbazone.[10,11,14] The structure of XIa–c is inferred from: (i) the formation of benzhydrylacetone, (ii) the presence in their IR spectra of strong carbonyl absorption at 1750 cm^{-1}.[3]

EXPERIMENTAL

Action of Grignard reagents on 4-arylidene-3-phenylisoxazolin-5-ones (Ib–e)

General procedure. To a Grignard solution (prepared from 1·0 g Mg and the appropriate quantity of alkyl halide in 100 ml dry ether), a suspension of each of Ib–e (2·0 g) in dry ether (100 ml) was added. The reaction mixture was refluxed (steam-bath) for 2 hr, most of the ether evaporated, and then decomposed with dil. (1:15) HCl aq. The product was filtered off, washed with ether, and crystallized from alcohol.

The 4-substituted-3-phenylisoxazolin-5-ones (Va–h), listed in Table 1, are all colourless, soluble in

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[12] A. Michaelis and H. Schlecht, *Ber. Dtsch. Chem. Ges.* 39, 1954 (1906).

[13] Cf. the stability of 3,5-dimethylisoxazole toward basic reagents, R. C. Elderfield, *Heterocyclic Compounds* Vol. 5; p. 466. John Wiley, New York (1957).

[14] H. Ulrich, J. N. Tilley and A. A. Sayigh, *J. Org. Chem.* 27, 2160 (1962).

TABLE. 1. GRIGNARD PRODUCTS (II) FROM 4-ARYLIDENE-3-PHENYLISOXAZOLIN-5-ONES(I)

Arylidene derivative	Grignard reagent, R =	Product	M.p.[a,b]	Yield, %	Formula	Carbon, %		Hydrogen, %		Nitrogen, %	
						Found	Calc.	Found	Calc.	Found	Calc.
Ib	phenyl	IIb	184°	84	$C_{22}H_{17}O_2N$	80·47	80·71	5·61	5·23	4·43	4·28
Ib	*p*-tolyl	IIc	185°	77	$C_{23}H_{19}O_2N$	80·63	80·91	5·45	5·61	3·93	4·10
Ib	ethyl	IId	120°	64	$C_{18}H_{17}O_2N$	77·11	77·39	6·01	6·13	5·12	5·01
Ib	*p*-anisyl	IIh	164°	73	$C_{23}H_{19}O_3N$	76·87	77·29	5·13	5·36	3·64	3·92
Ic	phenyl	IIe	174°	82	$C_{22}H_{16}O_2NCl^c$	72·92	73·03	4·12	4·43	3·51	3·87
Ic	*p*-tolyl	IIf	180°	75	$C_{23}H_{18}O_2NCl^d$	73·15	73·50	4·62	4·79	3·50	3·73
Ic	ethyl	IIg	120°	65	$C_{18}H_{16}O_2NCl^e$	68·64	68·90	4·85	5·10	4·23	4·47
Id	phenyl	IIh	164°	81							
Id	*p*-tolyl	IIi	165°	71	$C_{24}H_{21}O_3N$	77·31	77·60	5·61	5·70	3·52	3·77
Id	benzyl	IIj	130°	61	$C_{24}H_{21}O_3N$	77·42	77·60	5·53	5·70	3·43	3·77
Id	ethyl	IIk	108°	60	$C_{19}H_{19}O_3N$	73·28	73·76	6·01	6·19	4·31	4·53
Ie	phenyl	IIl	174°	74	$C_{23}H_{17}O_4N$	74·10	74·38	4·33	4·61	3·32	3·77
Ie	*p*-tolyl	IIm	184°	62	$C_{24}H_{19}O_4N$	74·54	47·79	4·62	4·97	3·41	3·63
Ie	ethyl	IIn	104°	61	$C_{19}H_{17}O_4N$	70·18	70·57	5·11	5·30	4·12	4·33

[a] All m.p. are uncorrected.
[b] All products melt with decomposition.
[c] Cl, Found: 9·51, Calc.: 9·82%.
[d] Cl, Found: 9·14, Calc.: 9·45%.
[e] Cl, Found: 11·01, Calc.: 11·32%.

NaOH aq. (10%), and give a yellow colour with conc. H_2SO_4 and a green colour with alcoholic $FeCl_3$ solution.

Reaction of 4-arylidene-3-phenylisoxazolin-5-ones (Ib–d) *with benzene in presence of aluminium chloride*

To a suspension of anhydrous $AlCl_3$ (3·2 g) in dry thiophene-free benzene (60 ml), which was previously stirred for 1 hr, a solution of each of Ib–d (2·0 g) in dry benzene (75 ml) was added gradually and stirring continued for an additional 3 hr at room temp. The complex was decomposed with dil. (1:15) HCl aq. (150 ml), the benzene solution separated, dried and evaporated under red. press. The oily residue was triturated with dil. alcohol and crystallized from alcohol. The products proved to be identical (m.p. and mixed m.p. and IR spectra) with the Grignard products IIb, e, h, respectively. Yields were 77, 65, 69%, respectively.

Action of Grignard reagents on 4-arylazo-3-methyl (or phenyl)-isoxazolin-5-ones (IIIa–g)

General procedure. To a Grignard solution (prepared as described above), a suspension of each of IIIa–g in dry ether 100 ml was added. The reaction mixture was refluxed for 1 hr, cooled, and decomposed (with sat. NH_4Cl aq.). The ethereal layer was separated, dried (Na_2SO_4) and allowed to evaporate slowly. The oily residue was triturated with cold acetic acid and the resulting solid crystallized from acetic acid.

The 5-substituted-4-arylazo-3-methyl (or phenyl)-isoxazoles (IVa–m), listed in Table 2, are yellow to orange in colour. They are insoluble in NaOH aq. and give yellow to brown colouration with H_2SO_4.

Action of sodium hydroxide on 3-methyl-4-phenylazoisoxazolin-5-one (IIIa)

A suspension of IIIa (1·0 g) in NaOH aq. (20%; 100 ml) was refluxed 2 hr. The resulting red solution was cooled, acidified with HCl aq. and the product (0·95 g) identified as unchanged IIIa (m.p. and mixed m.p.).

Behaviour of 4-acetyl-3-phenylisoxazolin-5-one (VI)

(a) *With Grignard reagents.* To a solution of ethyl-, phenyl, or *p*-tolylmagnesium halide (prepared as described above), a suspension of VI (2·0 g) in dry ether (100 ml) was added. The reaction mixture was refluxed 2 hr, kept overnight at room temp., decomposed with dil. HCl aq. and extracted with benzene. The oily residue, which was obtained upon evaporation of the benzene layer, was triturated with dil. alcohol, and the solid crystallized from alcohol, m.p. 154°, not depressed when mixed with an authentic sample of 3-phenylisoxazolin-5-one. Yields were 81, 76, 74%.

(b) *Magnesium–magnesium iodide mixture.* Mg powder (1·0 g), suspended in dry ether (100 ml) was treated portionwise with I_2 (5·0 g) in the cold, the reaction took place immediately, and the mixture was refluxed until almost colourless, excess Mg then being filtered off. To the filtrate, VI (2·0 g) was added; the mixture was refluxed 2 hr, decomposed with dil. HCl aq. and the product (1·6 g) proved to be 3-phenylisoxazolin-5-one (m.p. and mixed m.p.).

(c) *Lithium aluminium hydride.* A suspension of powdered $LiAlH_4$ (0·5 g) in dry ether (100 ml) was refluxed 15 min; VI (1·0 g) was added and the reflux continued for 2 hr. The reaction mixture was decomposed with dil. HCl aq. and the product (0·75 g) proved to be 3-phenylisoxazolin-5-one.

4-*Diarylmethyl-3-methyl (or phenyl)-5-methoxyisoxazoles* (Xa–g)

General procedure. An ethereal solution of diazomethane (prepared from 4·0 g nitrosomethylurea) was added to each of IIa–c, e, h, i, l (1·0 g) and the reaction mixture kept overnight in a refrigerator. The oily residue, obtained upon evaporation of the ether, was triturated with dil. alcohol and the resulting solid crystallized from alcohol.

The 4-diarylmethyl-3-methyl (or phenyl)-5-methoxyisoxazoles (Xa–g), listed in Table 3, are all colourless. They are insoluble in NaOH aq. and give pale yellow colour with H_2SO_4 and no colour with $FeCl_3$ solution.

Xa was recovered essentially unchanged after being refluxed with alcoholic KOH solution (10%) for 3 hr.

TABLE 2. GRIGNARD PRODUCTS (IV) FROM 4-ARYLAZO-3-SUBSTITUTED-ISOXAZOLIN-5-ONES (III)

Arylazo derivative	Grignard reagent, R =	Product	M.p.[a,b]	Yield, %	Formula	Carbon, % Found	Carbon, % Calc.	Hydrogen, % Found	Hydrogen, % Calc.	Nitrogen, % Found	Nitrogen, % Calc.
IIIa	phenyl	IVa	99°	56	$C_{16}H_{13}ON_3$	72·64	72·98	4·71	4·98	15·73	15·96
IIIa	*p*-tolyl	IVb	88°	59	$C_{17}H_{15}ON_3$	73·33	73·63	5·31	5·45	14·96	15·15
IIIb	phenyl	IVc	98°	61	$C_{17}H_{15}ON_3$	73·41	73·63	5·22	5·45	15·23	15·15
IIIb	*p*-tolyl	IVd	110°	65	$C_{18}H_{17}ON_3$					14·01	14·42
IIIc	phenyl	IVe	100°	58	$C_{17}H_{15}ON_3$					15·03	15·15
IIIc	*p*-tolyl	IVf	123°	62	$C_{18}H_{17}ON_3$	74·57	74·20	5·96	5·88	13·99	14·42
IIId	phenyl	IVg	150°	66	$C_{20}H_{15}ON_3$	76·17	76·66	4·89	4·83	13·24	13·41
IIId	*p*-tolyl	IVh	175°	71	$C_{21}H_{17}ON_3$					12·63	12·84
IIIe	phenyl	IVi	126°[c]	63	$C_{21}H_{15}ON_3$	77·47	77·52	4·75	4·65	12·55	12·92
IIIe	*p*-tolyl	IVj	115°	57	$C_{22}H_{17}ON_3$	77·70	77·85	5·26	5·05	12·37	12·38
IIIf	phenyl	IVk	110°	56	$C_{22}H_{17}ON_3$	78·05	77·85	5·08	5·05	12·33	12·38
IIIf	*p*-tolyl	IVl	125°	64	$C_{23}H_{19}ON_3$					11·71	11·89
IIIg	phenyl	IVm	161°	72	$C_{22}H_{17}ON_3$	77·78	77·85	5·16	5·05	12·51	12·38

[a] All m.p. are uncorrected.
[b] All products melt with decomposition.
[c] Not depressed when mixed with 3,5 diphenyl-4-phenylazo-5-isoxazole, prepared after Garg, ref. 6.

TABLE 3.—DIARYLMETHYL-3-SUBSTITUTED-5-METHOXYISOXAZOLES (Xa–g)

Methoxy-isoxazole	M.p.[a]	Yield, %	Formula	Carbon, % Found	Carbon, % Calc.	Hydrogen, % Found	Hydrogen, % Calc.	Nitrogen, % Found	Nitrogen, % Calc.
Xa	84°	64	$C_{18}H_{17}O_2N$	77·19	77·39	6·14	6·13	5·39	5·01
Xb	140°	71	$C_{23}H_{19}O_2N$	80·63	80·91	5·74	5·61	4·30	4·10
Xc	116°	65	$C_{24}H_{21}O_2N$	80·92	81·10	5·81	5·96	4·03	3·94
Xd	108°	61	$C_{23}H_{18}O_2NCl$[b]	73·31	73·50	4·62	4·80	3·70	3·73
Xe	125°	69	$C_{24}H_{21}O_3N$	77·32	77·60	5·41	5·70	3·55	3·77
Xf	136°	72	$C_{25}H_{23}O_3N$	77·61	77·90	5·94	6·01	3·32	3·63
Xg	128°	75	$C_{21}H_{19}O_4N$	74·63	74·79	4·56	4·97	3·86	3·63

[a] All m.p. are uncorrected.

[b] Cl, Found: 9·31, Calc.: 9·45%.

4-Diarylmethyl-2-methyl-3-substituted-isoxazolin-5-ones (XIa–c)

Each of IIa, b, e (2·0 g) was dissolved in dil. NH_4OH aq., conc. $AgNO_3$ aq. was then added till complete precipitation. The silver salt was filtered off, washed with dil HNO_3 aq. and then with water. A suspension of the dry silver salt, methyl iodide (5 ml) and methanol (50 ml) was refluxed 1 hr, filtered from the AgI and evaporated. The solid, which was obtained, was crystallized from alcohol.

4-Diphenylmethyl-2,3-dimethylisoxazolin-5-one (XIa) formed colourless needles (1·3 g), m.p. 106° (Found: C, 76·99; H, 6·02; N, 5·44. $C_{18}H_{17}O_2N$ requires: C, 77·39; H, 6·13; N, 5·01%). XIa was also obtained in 66% by boiling IIa with excess dimethylsulphate for few min, cooling, and pouring into water.[15]

4-Diphenylmethyl-2-methyl-3-phenylisoxazolin-5-one (XIb) formed colourless needles (1·55 g), m.p. 138° (Found: C, 80·52; H, 5·41; N, 3·87. $C_{23}H_{19}O_2N$ requires: C, 80·91; H, 5·61; N, 4·10%).

4-(*p*-Chlorophenylphenyl)methyl-2-methyl-3-phenylisoxazolin-5-one (XIc) formed colourless needles (1·6 g), m.p. 125° (Found: C, 73·31; H, 4·68; N, 3·51; Cl, 9·22. $C_{23}H_{18}O_2NCl$ requires: C, 73·50; H, 4·80; N, 3·73; Cl, 9·45%).

Action of potassium hydroxide on XIa

A solution of XIa (1·0 g) in alcoholic KOH aq. (10%, 100 ml) was refluxed 2 hr, poured into ice-cold water and extracted with ether. The oily residue was dissolved in alcohol and warmed with semicarbazide hydrochloride. On cooling colourless crystals (0·55 g) were formed, m.p. 165°, not depressed when mixed with an authentic sample of benzhydrylacetone semicarbazone.[16]

The IR spectra were measured using a Perkin-Elmer model 137B in Nujol.

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[15] G. G. Henderson and M. A. Parker, *J. Chem. Soc.* **71**, 676 (1897).