form, producing a light yellow coloration, while they are insoluble in water and petroleum ether.

Derivatives of Anils. p- Nitrophenyl hydrazones, 2,4-dinitrophenyl hydrazones, semicarbazones, and the oximes of the above anils were prepared by the usual methods. These derivatives were crystallized from absolute alcohol except the p- nitrophenyl hydrazone of o- toluidine which could be crystallized from methanol. The yield of the derivatives was almost quantitative. The characteristics of the above derivatives are given in Table II.

The oximes give color reactions with alcoholic solution of heavy metal ions, especially copper, cobalt, nickel, and iron (ic). The colors are all green of varying shades ranging from yellow green (nickel), to bright green (copper) and dark green (cobalt). With ferric ions color response is given by only two of the above oximes—*viz.*, phenacylidene β -naphthylamine and phenacylidene o- toluidine oximes which give reddish orange and violet colors.

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Chemistry of Imidoyl and Amide Chlorides On the Preparation and Properties of N-Substituted 2-Furimidoyl Chlorides. N,N'-Disubstituted 2-Furamidines

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N-Monosubstituted-2-furamides C_4H_9O —CONHR, where $R = aryl or n-C_3H_7$ —, $n-C_4H_9$ —, or $C_6H_5CH_2$ —, on reaction with PCIs gave new imidoyl chlorides, C_4H_3 — C(Cl) = NR; with $R = CH_3$ —, C_2H_5 —, and iso- C_3H_7 —, however, amide chlorides, C_4H_3O —CCl₂NHR, subsequently convertible to imidoyl chlorides, were obtained; with R = tert- C_4H_9 —, the alkyl group was eliminated to form 2-furonitrile and tert-butyl chloride. The new imidoyl chlorides were converted with primary amines to a number of new N_1N' -disubstituted-2-furamidines and their salts.

ALTHOUGH a large number of imidoyl chlorides have been prepared (3, 15), the present paper reports the first isolation and characterization of such derivatives obtained from N-substituted amides of 2-furoic acid.

Depending upon the nature of the N-substituent in the 2-furamide, the product of the reaction with phosphorus pentachloride may be either the imidoyl or the amide chloride (9), or fragmentation products.

The eleven N-arylimidoyl chlorides (I-XI) were obtained in good yield, either as viscous yellow oils or as crystalline solids. The reaction between N-alkyl-2-furamides and PCl₅, however, does not follow the same pattern. Thus, N-(npropyl)- and N-(n-butyl)-2-furamides reacted with evolution of hydrogen chloride yielding the imidoyl chlorides (XIV, XVI), but N-methyl-, N-ethyl-, and N-isopropyl-2-furamides reacted without evolution of hydrogen chloride to yield the amide chlorides. The amide chlorides, similar to the ones reported previously (3, 9), were extremely sensitive to moisture and not isolable in a pure state. Heating of the amide chlorides in dry benzene resulted in the imidoyl chlorides (XII, XIII, XV). Dry pyridine can be used in place of benzene with the same result.

N-alkyl-2-furimidoyl chlorides are thermally less stable and more sensitive than the N-aryl analogs. The ease of thermal decomposition on varying the nature of the alkyl

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group increases in the order prim. < sec. < tert.

Consistent with the results of Degnan and Pope (8) is the authors' observation that the reaction of *N*-tert-butyl2furamide with PCl₅ gives 2-furonitrile and tert-butyl chloride, presumably by immediate decomposition of the unstable intermediate imidoyl chloride. This can be rationlized in terms of a considerable fragmentation effect of the tert-butyl group. The instability of *N*-phenylsulfonyl-2furimidoyl chloride, which spontaneously decomposes into furonitrile and benzenesulfonyl chloride, may also be noted. This had not been anticipated since the corresponding *N*-phenylsulfonylimidoyl chlorides of other aliphatic and aromatic counterparts are very stable (4).

Existence of any syn-anti equilibria in the prepared imidoyl chlorides, otherwise found in sterically similar compounds (11, 13), was not apparent. A recent attempt to detect the presence of syn-anti isomers of imidoyl chlorides indicated only the presence of anti isomers (10). This appears to be consistent with the stereochemistry of imidoyl chlorides prepared from oximes (7).

In addition to direct identification, all the imidoyl chlorides were converted to N,N'-disubstituted-2-furamidines (8, 12). Contrary to Degnan and Pope's observation (8), N-aryl-2-furamides can be converted to N-aryl-N'-alkyl-2furamidines via the imidoyl chlorides in the presence of an alkyl amine. In this case, however, a considerable excess of the alkyl amine has to be used.

The experimental results obtained are presented in Tables I and II. All melting points are uncorrected. Crystalline

Table I. N-Substituted-2-Furimidoyl Chlorides

Reaction Conditions

Composition, % Misc.	H N CI ^e	3.92 6.81 17.24 n ² 1.6312 3.66 7.03 17.37 A巻 1.9960	6.38					0.40	0.40 14.77 \mathbf{n}_{2}^{D} 14.73 \mathbf{d}_{2}^{D}	0.40	0.40 14.77 n ₆ 14.77 n ₆ 14.77 d ₅ 14.68	0.40 14.77 ng 14.77 ng 14.77 dg 14.77 dg 14.15 14.15	0.40 14.77 14.73 14.77 14.77 14.15 14.19 14.19	0.400 14.77 14.77 14.77 14.77 14.15 14	0.40 14.77 14.73 14.77 14.77 14.16 14.19 14.19 14.19 15.00 15.00	0.40 14.77 14.77 14.77 14.77 14.15 14.17 14.17 14.17 14.17 14.17 14.17 14.17 14.17 14.15 14.15 14.15 14.15 14.15 14.15 14.17 14.17 14.17 14.17 14.17 14.15 14.15 14.15 14.15 14.15 14.15 14.15 14.15 14.15 14.15 14.15 14.15 14.17 14.17 14.15 14.	0.40 14.77 14.77 14.77 14.77 14.77 14.15	5.77 5.77 5.77 5.77 5.77 5.77 5.77 5.77	6.40 14.77 14.77 14.73 14.77 14.73 14.77 14.15 114.15 14.16 114.15 14.16 114.15 14.16 114.15 14.16 114.15 14.16 114.15 14.16 114.15 14.16 114.16 14.16 114.15 14.16 5.48 14.74 5.48 5.74	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	9.49 9.49 9.49 9.49 9.49 9.496 9.4666 9.4666 9.4666 9.4666 9.4666 9.4666 9	9.40 14.77 14.77 14.77 14.77 14.77 14.77 14.77 14.77 14.77 14.15 14.16 14.16 14.15 14.15 14.16 14.15 14.16 14.16 14.16 14.15 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.74 14.16 5.74 14.74 9.49 24.86 2.48 24.70 2.48 24.74 2.56 24.86	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	9.49 9.49 9.49 9.49 9.49 9.49 9.49 9.256 9.49 1.4.15	9.76 9.47 9.77 9.77 9.79 9.76 9.79 9.79 9.70 9.79 9.79 9.79 9.79 9.79 9.79 9.79 9.79 9.79 9.79 9.79 9.79 14.15 14.74 14	0.40 14.77 14.77 14.77 14.77 14.77 14.77 14.77 14.77 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.16 14.74 12.06 14.74 12.06 22.250 13.06 20.066 11 20.066 11 11.16	9.40 14.77 14.77 14.77 14.77 14.73 14.77 14.15 14.15 14.15 5.47 24.70 9.49 24.70 9.49 24.70 22.250 24.70 22.250 22.56 9.88 22.56 11 20.86 06.83 0.89	0.40 14.77 1.	9.40 14.77 14.77 14.77 14.77 14.77 14.73 14.73 14.73 14.73 14.73 14.73 14.73 14.15 5.48 5.74 14.15 5.74 14.74 1	9.40 14.77 14.77 14.77 14.77 14.77 14.77 14.16 14.15 14.16 14.16 14.16 14.19 14.16 14.19 14.16 14.19 14.16 14.19 2.48 5.777 2.48 5.777 2.48 5.778 3.48 5.779 2.48 5.770 2.255 9.906 3.48 11.19.206 3.88 19.906 3.88 19.906 3.88 1.1 1.1	14.17 14.15
Com	C	64.24 64.03	65.62	65.22	65.62 37	65.62 65.62	65.74	20.02	55.03	55.03 55.02	55.03 55.02 55.00	55.03 55.02 52.71	55.03 55.02 52.71 52.86	55.03 55.02 52.38 52.38 52.38	55.03 55.02 55.00 55.27 55.28 61.15 61.15	55.03 55.02 55.02 52.70 52.71 52.28 61.15 61.23	55.03 55.03 52.71 52.86 52.88 52.71 52.88 51.15 61.15 70.48	55.03 55.03 52.71 52.71 52.28 61.15 70.45 70.45 70.45	55.03 55.03 52.71 52.23 52.28 61.15 70.46 70.46 70.46	55.03 55.03 55.00 55.00 55.00 55.00 51.18 70.45 70.45 71.13	55.03 55.03 55.00 55.00 52.11 50.05 61.15 70.45 61.15 70.45 71.13 70.45 50.19	55.03 55.03 52.71 52.71 52.88 50.15 70.45 50.11 50.45 50.11 50.45 50.41 50.44	55.03 55.03 52.71 52.71 52.86 50.02 70.44 70.44 71.13 70.44 53.24 71.13 70.44 53.24 71.13 70.44 53.24 71.13 73.24 73.24 73.24 73.24 73.24 74 75 75 75 75 75 75 75 75 75 75 75 75 75	55.03 55.03 52.11 52.23 50.04 70.45 50.19 53.24 50.19 53.24 50.19 53.24 50.19 53.24 50.19 53.24 50.19 53.24 50.19 53.24 50.19 53.24 50.19 53.24 50.19 53.24 54 55.25 55.25 55.00 55.	85.03 85.03 85.00 85.00 85.00 115 70.45 86.113 70.45 85.33 80.44 113 70.45 85.33 80.113 85.33 80.113 85.33 80.113 85.33 80.113 85.33 80.113 85.33 80.113 85.33 80.113 85.33 80.113 85.33 80.113 85.35 85.35	85.03 85.03 85.00 85.04 85.04 11.15 85.04 11.15 10.45	85.03 85.03 82.11 70.44 81.15 85.83 85.94 85.83 85.85 85.83 85.85	85.03 85.03 85.00 85.04 1.15 1.15 1.13 1.13 1.13 1.13 1.13 1.13	85.03 85.03 82.11 86.115 85.04 86.113 86.5	8,8,00 8,8,00 8,9,00 8,8,9,8,9,9,9,9,9,9,9,9,9,9,9,9,9,9,9,9	55.03 55.03 52.11 52.23 55.05 55.555	85.00 85.000 85.000 85.000 85.000 85.0000000000
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	Temp., °C.	100	100		100	100	č	3	100			0 6 -08	06-08	80-90 110-140	80-90 80-90 110-140 70-85	80-90 110-140 70-85	80-90 80-140 70-85	80-90 110-140 70-85 100	80-90 80-90 70-85 100 70-90	80-90 110-140 70-85 100	80-90 80-90 70-85 100 70-90 60	80-90 80-90 70-85 100 70-90 60	200 80-90 110-140 70-85 100 70-90 60 20	80-90 1110-140 70-85 100 60 20	200 80-90 1110-140 70-85 100 70-90 60 20	80–90 80–90 70–85 70–90 60 20	80-90 80-90 110-140 70-85 70-90 60 75 130	80-90 1110-140 70-85 100 60 20 130	80–90 80–90 70–85 70–85 60 70–90 60 75 130	80–90 80–90 70–85 60 80 100 130 130	80-90 80-90 70-85 70-90 60 75 130 100	80-90 80-90 70-85 70-90 60 75 130 100 100
	R	C,H,—	2'-CH ₃ ·C ₆ H ₄		3'-CH ₃ -C ₆ H ₄	4'-CH ₃ -C ₆ H ₄		3'-U-CeH,	4'-Cl.C.H			3'-N02.C4H4	3'-N02.C.H.	3'-N0 ₂ ·C ₆ H,	3'-N0 ₂ ·C ₆ H ₄ 4'-N0 ₂ ·C ₆ H ₄ 4'-CH ₃ 0-C ₆ H ₄	3′-N0 ₁ ·C ₆ H ₄ 4′-N0 ₁ ·C ₆ H ₄ 4′-CH ₃ 0·C ₆ H ₄	3′-NO ₁ ·C a H,− 4′-NO ₁ ·C a H,− 4′-CH ₃ O·C a H,− 1-C ₀ H,−	2. John J. C.H	3'-N0y.C,H, 4'-N0y.C,H, 4'-CH,0.C,H, 4'-CH,0.C,H, [-C ₁₀ H, (a-mphthyl-) 2.C ₁₀ H,	3'-NO ₂ .C ₆ H ₄ 4'-NO ₂ .C ₆ H ₄ 4'-CH ₃ O.C ₆ H ₄ 1-C ₁₆ H ₇ (c-naphthyl-) 2-C ₁₆ H ₇ (β-naphthyl-)	2	3'-NO3.CaH, 4'-NO3.CaH, 4'-CH30.CaH, 1-CaH, (a-naphthyl-) 2.CaH, (3-naphthyl-) CH3	3'-NO ₂ -C ₆ H ₄ 4'-NO ₂ -C ₆ H ₄ 4'-CH ₃ O-C ₆ H ₄ 1-C ₁₀ H ₁ (α-naphthyl-) CH ₃ C ₃ H ₃ ' C ₂ H ₃ '	2	2	2	3'-N0 ₂ .C,H, 4'-N0 ₂ .C,H, 4'-CH ₃ 0.C,H, 4'-CH ₃ 0.C,H, (a-mphthyl-) (b-mphthyl-) CH ₃ ' n-C ₃ H, n-C ₃ H, "	2	2	3'-N03.CdH,	200.44 3'-N030.4.4 4'-CH30-0.6.44 1-CuaH+ (a-naphthyl-) 2CuH+ ¹ (g-naphthyl-) CH3 ⁶ C3H3 ⁶ n-C3H3 ⁶ n-C4H3 ⁶ n-C4H4 ⁶ c4H3-CH4- ⁶	200.4.4 3'-N0,-CaH, 4'-CH ₃ 0-CaH, 4'-Ch ₃ 0-CaH, 1-C ₁₀ H, (6-naphthyl-) (6-naphthyl-) (9-naphthyl-) CH ₃ -' n-C ₃ H, iso-C ₃ H, iso-C ₃ H, iso-C ₃ H, c ₂ H ₃ N-Loopropylbenz-
	Compound	Ι	Π	i	III	N	:	>	N			NII	IIA	111A 111A	IIIA XI	ил 111У 111	IIIA XI	ли хи хи хи	UIV XI XI	ли ил хі хі хі	ин хи хи хи хи	ли хи хи хи хи	VIII VIII VIII VIII VIII VIII VIII VII	VII VII VII VII VII VII VII VII VII VII	ин хи хи хи хи хи	ли хи хи хи хи хи хи хи хи хи хи хи хи хи	ин хи хи хи хи хи хи хи хи	VIII VIII VIX VIX VIX VIX VIX VIX	ин хи хи хи хи хи хи хи хи хи хи		ли или или или или или или или или или	ин ин ин ин ин ин ин хи хи хи хи хи хи хи хи хи хи хи хи хи

*Chlorine analyses were determined by potentiometric titrations of the water-acetic acid hydrolyzates of the imidoyl chlorides; under the conditions given, only imidoyl chloride chlorine was hydrolyzed and determined. *The compound was crystallized from ether (110-120° C.). *The compound was prepared by treatment (dehydrohalogenation) of the intermediate amide chloride with either benzene or pyridine. *The compound was prepared from hitherto unreported N-isopropyl-2-furamide, obtained by the Schotten-Baumann procedure

from 2-furoyl chloride and isopropyl amine in a 93% yield. The amide crystallized from aqueous ethanol as colorless needles, m.p. 125–126° C. Anal. Calcd. $C_{6}H_{11}NO_{2}$: C, 62.72; H, 7.24. Found: C, 62.72; H, 7.24. 'Owing to the extensive decomposition during the vacuum distillation; the imidoyl chloride was identified as amidine (see Table II, compounds XVIIa and XVIIb). 'Thionyl chloride instead of phosphorus pentachloride was used.

Table II. N,N'-Disubstituted-2-Furamidines

OR CAR

		Misc.	Crystl.: pet. ether	Crystl.: ethanol-ether	Crystl.: pet. ether; no. m.p.	depression with XVIIa Crystl.: aq. methanol, pet.	ether Crystl.: aq. ethanol	Crystl.: aq. ethanol; no m.p.	depression with XIVb Crystl.: aq. ethanol; no m.p.	depression with XVa Crystl.: aq. ethanol; no m.p.	depression with XVIa CrystL: aq. ethanol, pet.		Urystl.: aq. methanol	Crystl.: ethanol-ether	Crystl.: aq. methanol	Crystl.: ethanol-ether	Crystl.: pet. ether	Crystl.: ethanol-ether	Crystl.: pet. ether	Crystl.: aq. ethanol	Crystl.: aq. ethanol	Crystl.: a q. ethanol	Crystl.: aq. ethanol	Crystl.: aq. ethanol	Crystl.: aq. ethanol	Crystl.: aq. ethanol	Crystl.: aq. ethanol	Crystl.: pet. ether	(Continued on page 214)
		z	10.68	9.38 9.38	60.6 · · ·	13.93	14.14 13.07	13.22	:	• • •	11.56	11.31	10.37	8.96 9.19	10.13 10.30	8.96 8.96	9.20	10.38 8.96	8.95 9.65 2.05	9.83 11.27	11.46 11.27	13.68	13.97	16.44	11.47	11.11	8.98 8.98	86.8 80.6	
	n, %	Н	5.38	5.06 5.06	ол-е	6.04	5.88 6.59	6.57	;	:	7.49	7.48 5 84	2.26 2.26	5.48 5.60	5.84 5.73	5.48	5.84 5.84	5.97 5.48	5.20 6.25	5.27	5.25 5.27	4.26	4.13 5.05	5.01 4.26	4.34 6.60	5.52	5.17 5.17	5.17 4.93	
	${\bf Composition}, \%$	0	77.84	68.33 68.33 69.00	77.00	71.98	72.17 72.87	73.12	:	÷	74.35	74.39	78.46	69.11 69.18	78.23 78.48	69.11 69.11	09.32 78.23	78.56 69.11	69.16 78.59 70.70	62.77	62.98 62.77 52.09	66.44	60.22	66.44 66.44	99.99 88.83	73.95	67.67 80.75 71.08	80.75 81.10	
	Con		Calcd.	Calcd.	r ourig	Calcd.	Found Calcd.	Found			Calcd.	Found	Found	Calcd. Found	Caled. Found	Calcd.	r ound Calcd.	Found Calcd.	Found Caled.	round Calcd.	Found Caled.	Calcd.	round Calcd.	round Calcd.	Found Calcd.	Calcd.	Found Calcd.	r ound Calcd. Found	
		Formula	C ₁₇ H ₁₄ N ₂ O	C ₁₇ H ₁₅ ClN ₂ O	C ₁₈ H ₁₆ N ₂ O	$C_{12}H_{12}N_2O$	C ₁₃ H ₁₄ N ₂ O	C ₁ ,H ₁₆ N ₂ O	C ₁₄ H ₁₆ N ₂ O	C ₁₅ H ₁₆ N ₂ O	C ₁₅ H ₁₈ N ₂ O			CisHr/CIN2O	C ₁₈ H ₁₆ N ₂ O	C ₁₈ H ₁₇ CIN ₂ O	C ₁₈ H ₆ N ₂ O	C ₁₈ H ₁₇ CIN ₂ O	C ₁₉ H ₁₈ N ₂ O	C ₁₃ H ₁₈ CIN ₂ O	C ₁₂ H ₁₂ ClN ₂ O	C17H13N3O3	C 13 H 13N 3O 3	C ₁₇ H ₁₃ N ₃ O ₃	C ₁₄ H ₁₆ N ₂ O ₂	C ₁₈ H ₁₆ N ₂ O ₂	C ₂₁ H ₁₆ N ₂ O	C ₃ H ₄ N ₂ O	
		M.P., °C.	91-2	235-6	06-68	99 –100	80-81	64-5	87-8	70-1	75–6	0 02	6-01	191-2	71-2	215-16	91-2	216-17	8081	104-5	105-6	148-9	107-8	154-5	86-7	91-2	115-16	85-6	
	Yield.	%	72	8 2	8	82	16	100	100	76	94	71,	: 8	8	77	87	64,	75	\$	*	8	28	97	51	100	77	85	85	
Conditions	Product formed	as: ^d	Hychl.	Hychl.	F.b.	F.b.	F.b.	F.b.	F.b.	F.b.	F.b.	Hvchl	חייירו	nycu.	Hychl.	Hychl.	Hychl.	Hychl.	Hychl.	F.b.	F.b.	F.b.	F.b.	F.b.	F.b.	F.b.	F.b.	F.b.	
Reaction (Time.	hours		72	1	12	12	12	12	12	240		70	2		72		72	12	12	12	240	12	5 at 80° C.	12	Very fast	8	8	
		$\mathbf{R'}/\mathbf{R}^b$		2	2.9	9.2	4.8	4.2	4.2	3.9	4.5		66	7-7		2.0		2.1	4.0	4.2	4.2	2.0	4.0	2.0	3.8	2.0	2.2	2.9	
		R	C ₆ H ₅ —		$C_6H_3 \cdot CH_2 -$	CH ₃	$C_2H_{s}-$	<i>n</i> -C ₃ H ₇	480-C3H7	n-C,H ₉ . –	tert-C4Hs—	C,H,			C ₆ H ₅		C,Hs		C ₆ H ₅ CH ₂ —	C_2H_6-	$C_{a}H_{b}-$	C,Hs	$C_2H_{s}-$	C ₆ H ₆ —	C_2H_5-	C,Hs—	C ₆ H ₅ —	C ₆ H ₆ —	
		R	C,H,		C ₆ H ₆ —	C "H "—	C,H,	C ₆ H ₅	C ₆ H ₅ —	C ₆ H ₅ —	C ₆ H ₅ —	2'-CH _* C _* H'—			3'-CH3C6H,		4'-CH ₃ -C ₆ H,—		4'-CH ₃ ·C ₆ H ₄ —	3′-Cl · C₄H,—	4'-Cl-C ₆ H,—	3'-NO2.C.H.	4'-N0 ₂ .C ₉ H ₄ —	4'-NO ₂ .C ₆ H,	4'-CH ₃ O·C ₈ H,	4'-CH ₃ O • C ₉ H,	$1-C_{10}H_{7}$ — ($lpha$ -nanhthvl-)	2-C ₁₀ H ₁	
		Compound	Ia	Ia-Hydrochloride	P	Ic	Id	Ie	If	Ig	Ł	IIa	II a. H vdrochlorida	aniioniioo indu	IIIa	IIIa-Hydrochloride	IVa	IVa-Hydrochloride	IVb	Va	VIa	VIIa	VIIIa	VIIIb	IXa	ІХЬ	Ха	XIa	

	Yield. Composition, %	% M.P., ° C. Formula C H N Mise.	80.95 5.56	Found 80.00 C ₁₂ H ₁₂ N ₂ O Calcd 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	74 106 8 C ₁₈ H ₁₈ N ₅ O ₈ Calcol. 16.31 Crystl.: aq. ethanol	85 80–1 C _{is} H _i N ₂ O round to	99 B.P., C. ₁₁ H. ₈ N.O Calcd. 68.01 9.34 Found 67.96 9.27			C ₆ H ₁₈ N ₂ O	89-50 C ₁₈ H ₁₆ N ₂ O Calcd. 78.24 5.84 10.14 Crystl.: aq. ethanol Found 78.51 5.68 10.18	:	90 96 7 C ₁₆ H ₁₈ N ₂ Calod. 80.63 7.61 11.76 Crystl.: aq. ethanol Found 80.89 7.84 12.04	cannot be distinguished. indicated, the reactions were performed at room temperature. ^d This column indicates form
Reaction Conditions	Product Time. formed	hours ^c as: ^d	12 F.b.	Very fast Hychl.	:	Very fast Hychl.	12 F.b.		Very fast Hychl.	fast	Very tast Hychl.	96 Hychl.	Very fast Hychl.	R' cannot be disting
Re		R'/R ^b h	2.0	1.4	:	2.0	2.2		1.9	1.2	:	~1		Owing to the tautomerism of N,N' -disubstituted amidines, R and R' ϵ
		R [′]	C ₆ H ₅ CH ₂ —	C ,H ,		C,H,	iso-C ₃ H ₇	C,Hs-	C ₆ H ₅	C,H,-	C ₆ H ₅ -	4'-CH ₃ -C ₆ H,		substituted amic
		R	2-C ₁₀ H ₁	CH ₃		C ₂ H _s	$n-C_3H_7-$	n-C ₃ H ₇	130-C3H7	n-C,H,	C4HsCH2-	C ₆ H ₅ CH ₂	N-Isopropyl-N'- phenylbenzamidine	[•] Owing to the tautomerism of N,N' -disubstituted amidines, R and R' cannot be distinguished.
		Compound	XIb	XIIa	XIIa-Picrate	XIIIa	XIVa	AIVb	ХVа	XVIa/	XVIIa	XVIIb		 Owing to the ta

analytical samples were derived by 2 to 3 recrystallizations from a suitable solvent followed by drying at 0.5 to 15 mm. for 2 to 10 hours at room temperature over P_2O_5 .

The N-monosubstituted-2-furamides were prepared from 2-furoyl chloride and the appropriate primary amine, according to the Schotten-Baumann method, or by use of pyridine as solvent (1, 2, 5, 6, 14).

N-Substituted-2-furimidoyl chlorides (I-XVII). The imidoyl chlorides (Table I) were prepared by the following general procedure: In a Claisen flask equipped with a reflux condenser and a drying tube, an intimate mixture of the N-monosubstituted amide and PCl_5 , in approximately 1- to -1 ratio, was heated from 15 minutes to 3 hours over 60° to 140° C. After completion of the reaction, the phosphorus oxychloride was removed under reduced pressure at 40° to 50°C., after which the remaining imidoyl chloride was distilled under vacuum. An analytical sample was obtained by redistillation.

If the reaction product was a stable amide chloride (XII. XIII, XV), the $POCl_3$ was removed under vacuum and the residue boiled under reflux of benzene for 1 to 2.5 hours, followed by removal of solvent; the resulting imidoyl chloride was purified as before.

N,N'-Disubstituted-2-furamidines. 2-Furamidines (Table II) were prepared in the following general way: In an Erlenmeyer flask equiped with a drying tube, the imidoyl chloride was dissolved in 2.5-10-fold amount of dry benzene, and a sufficient amount of primary amine was added to give a 20 to 400% molar excess. The mixture was allowed to stand at room temperature. The crystalline amidine hydrochloride was filtered, washed with benzene, and recrystallized from a mixture of ethanol-ether. The free amidine was liberated from an aqueous solution by addition of concentrated ammonia. The crude solid was filtered, washed with water. and recrystallized from either ethanol-water, methanolwater, or 60° to 80° C. petrol ether. If the crystalline reaction product consists of the amine hydrochloride, the free amidine may be obtained by filtration followed by evaporation of the benzene, and the amidine purified as above.

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