LITERATURE CITED

- 1. L. N. Yakhontov and M. F. Marshalkin, Tetrahedron Lett., No. 3, 2807 (1973).
- L. N. Yakhontov, M. F. Marshalkin, and E. V. Pronina, Khim. Geterotsikl. Soedin., No. 3, 351 (1972).
- 3. P. Y. Nelson and K. T. Potts, J. Org. Chem., 27, 3243 (1962).
- 4. D. Liberman, French Patent No. 1288703; Chem. Abstr., 58, 535 (1963).
- 5. A. Pollak and M. Tišler, Tetrahedron, 22, 2073 (1966).
- 6. I. Ya. Postovskii and N. B. Smirnova, Dokl. Akad. Nauk SSSR, 166, 1136 (1966).
- 7. L. N. Yakhontov and M. F. Marshalkin, Khim. Geterotsikl. Soedin., No. 2, 1638 (1972).
- 8. G. Karmas and P. Spoerri, J. Am. Chem. Soc., <u>74</u>, 1580 (1952).
- 9. G. W. Anderson and R. O. Roblin, J. Am. Chem. Soc., 64, 2902 (1942).
- 10. S. Sako, Chem. Pharm. Bull. (Tokyo), No. 10, 956 (1962).
- 11. A. Klages, Ber., 35, 2646 (1902).
- 12. H. Launschirm. Ann., 245, 279 (1888).
- 13. J. Druey, K. Meier, and K. E. Eichenberger, Helv. Chim. Acta, 37, 121 (1954).

HETEROCYCLIC ANALOGS OF PLEIADIENE.

XXXVI.* EFFECT OF N-SUBSTITUENTS ON THE RECYCLIZATION OF PERIMIDINES

A. F. Pozharskii, V. V. Dal'nikovskaya,

UDC 547.856.7

- V. I. Sokolov, A. A. Konstantinchenko,
- O. V. Yarikova, and L. L. Popova

Electron-acceptor substituents (phenyl, benzyl, methoxymethyl, acetonyl, and phenacyl) in the 1 position of perimidine do not have an appreciable effect on the ease of opening of the perimidine ring under the influence of aroyl chlorides in the presence of mild bases. However, some of them (C_6H_5 and CH_3OCH_2) substantially hinder the step involving the cyclization of the pseudo bases to arylperimidines under the influence of alkalis. It was shown by kinetic measurements that substituents in the N-aroyl group of N-methyl-N-formyl-N'-aroyl-1,8naphthalenediamines have virtually no effect on the rate of cyclization in alkaline media. A mechanism for the alkaline and acidic cyclization of the pseudo bases is proposed on the basis of the regularities observed. 1,2-Diarylperimidines were synthesized for the first time.

We have recently observed a new recyclization reaction that makes it possible to introduce virtually any aromatic, heteroaromatic, or vinylaromatic substituent [2, 3] in the 2 position of N-substituted perimidines. The reaction consists of two steps: the first step involves treatment of the N-substituted perimidine (I) with the chloride of the corresponding carboxylic acid, the radical of which one desires to incorporate in the μ position of the perimidine, in the presence of a mild base (triethylamine, diethylamine, and sometimes potassium carbonate). In this case a highly reactive N-acylperimidinium salt (VII), which is readily converted in the presence of hydroxide ions to pseudo base VIII (which exists in acyclic form IX), is formed. In the second step of the reaction pseudo base IX is refluxed with aqueous alkali, as a result of which the formyl group is split out, and 1,2-disubstituted perimidine XII is formed in high yield.

The aim of the present research was to study the effect of N-substituents on both steps of the recyclization reaction. Phenyl, benzyl, acetonyl, phenacyl, and methoxymethyl groups were used as N-substituents in the starting compound (the reaction for 1-methyl- and 1-dialkylaminoalkylperimidines was previously studied in [2, 3]). All of these substituents

*See [1] for communication XXXV.

Rostov State University, Rostov-on-Don 344006. Translated from Khimiya Geterotsiklicheskikh Soedinenii, No. 8, pp. 1125-1131, August, 1978. Original article submitted August 2, 1977.

TABLE 1. Basicity Constants of 1-Substituted Perimidines (in acetonitrile at 20°C)

Compound	I	11	111 (JV	v	VI
p K a	13,70	12,52	13,09	12,58	12,66	12,58

are electron acceptors of weak or moderate strength. Their effect on the ring-opening step should be made up of two opposing factors. On the one hand, electron-acceptor N-substituents by lowering the basicity may hinder the formation of salt VII; on the other hand, they increase the positive charge on the μ -carbon atom of the ring, thereby facilitating nucleophilic attack on this atom by hydroxide ions. We have established that the decrease in the basicity in II-VI as compared with 1-methylperimidine (I) is only 0.6-1.2 pK_a units (Table 1), which is not large enough to substantially hinder the first step in the reaction. Compounds II-VI react very readily with aroyl chlorides in the presence of triethylamine to give ring-opening products IXd-i in high yields. It should be noted that the solvents used in this step of the reaction should not be absolute, since the presence of a sufficient amount of moisture is necessary for the conversion of salt VII to the pseudo base. The reaction may also take place in absolute solvents due to atmospheric moisture but at a considerably slower rate. The structures of IX were proved by the results of elementary analysis and the IR and PMR spectra (we will discuss the latter in a separate communication).





xiia-h

In our examination of the second step of the reaction we strove to ascertain the effect of both the aroyl group and the substituent in the foramide group of pseudo base IX. For this, we initially studied the kinetics of the cyclization for IXa-c, which are distinguished by the presence of various substituents (H, p-Br, and p-OCH₃) in the benzoyl group.

The cyclization is accompanied by a marked change in the color of the mixture as a result of conversion of colorless IX to bright-yellow perimidines XII. However, it is not possible to use the band at 400-430 nm, which is responsible for the color of XII, for the spectrophotometric analysis of the reaction mixture, since the intensity of this band does not follow the Lambert-Beer law (the problem of its nature was discussed in [4]). However, it was found that the spectra of IX and XII in the UV region are sufficiently different (Fig. 1) to allow one to use a spectrophotometric method to measure the kinetics. The working wavelengths and the corresponding extinction coefficients are presented in Table 2. The reaction was carried out in ethanol, since the starting and final compounds are insoluble in water (it is convenient to carry out preparative syntheses in water).



TABLE 2. Working Wavelengths and Extinction Coefficients in the Measurement of the Rates of Cyclization

Compound	λ. nm	. E	Compound	λ, nm	ε	
IXa	340 337	1360 1700	XIIa	340 337	15420 15700	
IXb	280 340 337 280	8660 1360 1640 8500	XIIP	280 340 337	4120 16780 16800	
IXc	339 295	1520 11840	XIIc	280 339 295	4680 15200 5200	

The initial measurements showed that the rate of change in the concentration of IXa-c under the influence of one or two equivalents of alkali does not follow first- and secondorder equations. In view of this, the kinetic measurements were made in the presence of a large excess of alkali, i.e., under first-order reaction conditions. The cyclization kinetics in this case are satisfactorily described by the equation

$$k = \frac{1}{0.4343 \cdot t} \cdot \lg \frac{a}{a - x} \; .$$

where t is the time (in minutes), α is the starting IV concentration (in moles per liter), and x is the concentration (in moles per liter) of the VII formed in time t. The rate constants were also calculated graphically on the basis of the linear dependence t = f[log $(\alpha - x)$]. The k values determined by the two methods were in good agreement.

The most interesting result of the kinetic measurements was the closeness of the cyclization rate constants for IXa-c (Table 3). This constitutes evidence that the rate-determining step in the cyclization is the process in which the reaction takes place at a great distance from the aroyl group and is virtually independent of the nature of the substituent in this group. This step evidently may be the nucleophilic addition of a hydroxide ion to the formyl group to give intermediate complex X. The latter subsequently loses formate ion with subsequent conversion of N-anion XI to the corresponding perimidine XII.

The scheme for the cyclization is in agreement with the effect on it of substituents R in the formamide group. Whereas pseudo bases IXf-h, which contain N-benzyl, N-acetonyl, and N-phenacyl groups, readily undergo cyclization when they are refluxed in aqueous alkali to give perimidines XIIf-h (only somewhat more prolonged heating as compared with IXa is required), in the case of compounds with N-phenyl (IXd, e) and methoxymethyl (IXi) groups cyclization does not take place even on prolonged refluxing with alkali. Instead, the formyl group is split out to give, respectively, N-phenyl-N'-aroyl-1,8-naphthalenediamines or N-benzoyl-1,8-naphthalenediamine. The reason for this is undoubtedly the inert character of the N-anions XId, e, i formed in the deformylation of IXd, e, i because of the in-

TABLE 3. Rate Constants and Thermodynamic Parameters for the Cyclization Reaction

Com-	k, mi	n ⁻¹ (• 10 ³))	Ea.	∆S [≠] , cal•	10.4	ΔH≠.	
pound	30° 40°		45°	kcal/mole	mole ⁻¹	ign	kcal/mole	
IXa IXb IXc	5,65 5,76 5,83	11,7 11,4 11,6	18,0 20,0 18,3	13,67 12,90 12,90	-5,19 -5,74 -5,73	7,62 7,07 7,08	13,06 12,29 12,29	

creased electron-acceptor character of the N-phenyl and N-methoxymethyl groups (in the latter case the tendency of the N-methoxymethyl group to be detached also probably plays some role, although this sort of detachment is more characteristic for acidic media [5]).

We were able to obtain 1,2-diarylperimidines XIId, e by cyclization of N-phenyl-N^{*}aroyl-1,8-naphthalenediamines XId, e by refluxing in dilute hydrochloric acid. However, from a preparative point of view 1,2-diarylperimidines are obtained somewhat more simply from the extremely accessible N-phenyl-1,8-naphthalenediamine [6] by benzoylation and subsequent acidic cyclization of the N-benzoyl derivative.



Thus the recyclization reaction in the preparation of 1,2-diarylperimidines does not offer those advantages that obtain in the synthesis of 1-alkyl- and 1-ketoalkyl-2-arylperimidines by recyclization. For example, XIIg, h cannot be obtained by direct alkylation of 2-phenylperimidine with bromoacetone or phenacyl bromide under neutral or alkaline conditions [7], and the recyclization reaction is at present the only method for their synthesis and is very convenient.

It should be noted that in an attempt to bring about the cyclization of pseudo bases IXa-h themselves in acidic media we observed the formation of starting I-V in good yields. The process takes place with the elimination of a benzoyl group, apparently in conformity with the following scheme, which stipulates the initial protonation of the formyl group:



When pseudo base IXi is heated with acid, in addition to cyclization, one observes splitting out of a methoxymethyl group, as a result of which a perimidine is formed.

In the case of pseudo bases IXa, g-i we established that their thermolysis under neutral conditions is also accompaniedy by splitting out of an N-aroyl group and the formation of the starting N-substituted perimidine. However, this is an extremely slow process.

Thus this research has shown that the investigated electron-acceptor N-substituents have little effect on the first step of the recyclization reaction leading to the pseudo base; however, they may have a substantial effect on the cyclization of the latter under the influence of alkalis.

EXPERIMENTAL

The ionization constants in acetonitrile were measured with a potentiometer by the method in [8]. The IR spectra of solutions of the compounds in chloroform were obtained with a UR-20 spectrometer. The PMR spectrum of a solution of the compound in CDCl₃ was recorded with a Tesla spectrometer with hexamethyldisiloxane as the internal standard. Chromatography was carried out on aluminum oxide (elution with chloroform). The kinetics of the cyclization reaction were studied by spectrophotometry of solutions of the compounds in 96% ethanol with a Spektromom-203 spectrophotometer. The Lambert-Beer law is observed for all of the investigated compounds at the working concentrations $(1 \cdot 10^{-5} - 1 \cdot 10^{-4} \text{ g mole/liter})$ for the selected wavelengths. Alcohol solutions of the N-formyl-N'-aroyl-1,8-naphthalenedi-

Com- pound	mp, °C ^a	Found, %		o _. N	Empirical formula	Calc. %		$\frac{v, cm^{-1}}{N-H}$ C=O		Yield, %	
IXd IXe IX ^f	127—128 166—168 184—185	78,5 75,0 78,5	5,1 5,3 5,5	7,6 6,9 7,8	$\begin{array}{c} C_{24}H_{18}N_2O_2\\ C_{25}H_{20}N_2O_3\\ C_{25}H_{20}N_2O_2 \end{array}$	78,8 75,5 78,9	4,9 5,0 5,3	7,9 7,1 7,4	3380 3380 3310	1670 1670 1690	56 82 91
IXg	162	72,7	5,5	8,5	$C_{21}H_{18}N_2O_3$	72,8	5,2	8,1	3320	1730	77
IXh IXi XIId XIIe	$189 - 190 \\139 - 141 \\238 - 239 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 131 \\130 - 130 \\130 - 131 \\130 - 131 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130 \\130 - 130$	76,8 72,1 86,6 82,0	5,0 5,3 5,1 5,1	7,2 8,5 8,4 7,7	$\begin{array}{c} C_{26}H_{20}N_2O_3\\ C_{20}H_{18}N_2O_3\\ C_{23}H_{16}N_2\\ C_{24}H_{18}N_2O\end{array}$	76,5 71,9 86,3 82,3	4,9 5,4 5,0 5,2	6,9 8,4 8,7 7,99	3300 3350 —	1680 1710 —	81 89 80 92
XIII XIIg XIIh	138—140 b 164—165 196	79,6 82,5	4,9 5,2	 9,5 7,9	C ₂₄ H ₁₈ N ₂ C ₂₀ H ₁₆ N ₂ O C ₂₅ H ₁₈ N ₂ O	79,9 82,8	 5,4 5,0	9,3 7,7		1730 1710	57 93 96

TABLE 4. N,N'-Diacyl-1,8-naphthalenediamines (IX) and Perimidines (XII)

^aThe compounds were crystallized: IXe, f from benzenepetroleum ether, IXi and XIIe, g, h from aqueous alcohol, IXg, h from toluene, XIId from octane, and IXd from ethyl acetate. ^bAccording to the data in [10], this compound has mp 141°C.

amines (IXa-c) in KOH (a 20-fold excess) were first thermostatted at 30, 40, or 45° C, after which they were mixed rapidly. The instant at which they were mixed was reckoned as the beginning of the reaction. The initial concentration of IXa-c after mixing was on the order of $1 \cdot 10^{-4}$ g mole/liter. Conical flasks with ground-glass joints equipped with a reflux condenser (40 cm) and a drying tube filled with KOH granules served as the reactors. The sample-selection method was used for the measurements of the optical densitites at the selected wavelengths (Table 2). A total of 8-10 measurements were made, and the average degree of reaction was 75% (after 2-3 h). All of the kinetic experiments were repeated no less than three times.

Compounds I and VI were obtained by the method in [9]. The melting point of VI (79°C) was higher than the value previously presented (66°C), evidently due to the additional chromatographic purification. PMR spectrum of VI: δ 3.3 (s, CH₃), 4.8 (s, CH₂), 6.3 (q, 9-H), 6.8 (q, 4-H), and 7.03 ppm (m, 2- and 5-8-H).

See [6] for the synthesis of II and [7] for the synthesis of IV and V.

<u>1-Benzylperimidine (III)</u>. The method presented below is substantially better than the method described in [9]. A mixture of 4.7 g (0.028 mole) of perimidine, 6.7 g (0.028 mole) of N-methyl-N-benzylmorpholinium chloride, and 80 ml of o-xylene was refluxed with vigorous stirring in a nitrogen atmosphere for 5 h, after which it was cooled, and the precipitate was removed by filtration. The filtrate was evaporated at reduced pressure, and the residue was dissolved in chloroform and purified by column chromatography. The first fraction (yellow) was collected and worked up to give 3.3 g (46%) of yellow crystals with mp 134-135°C, in agreement with the data in [9].

<u>N-Methyl-N-benzylmorpholinium Chloride</u>. This compound was obtained by refluxing equimolar amounts of benzyl chloride and N-methylmorpholine in acetone for 3 h. The yield of colorless needles, with mp 244°C, was quantitative.

<u>N-Formyl-N'-aroyl-1,8-naphthalenediamines (IXa-i)</u>. A 0.012-mole sample of triethylamine was added to a solution of 0.01 mole of N-substituted perimidine in 50 ml of ether or benzene, and an ether solution of 0.01 mole of the corresponding chloride of the aromatic acid was added dropwise with stirring. The mixture was refluxed with stirring for 30 min, after which it was cooled, and the crystalline precipitate was removed by filtration and washed thoroughly with water (300-400 ml). Purification can be carried out by recrystallization, but column chromatography gives better results.

<u>General Method for the Alkaline Cyclization of Diacylnaphthalenediamines IX</u>. A suspension of 1 mmole of IXf-h in 5 ml of 10% potassium hydroxide solution was refluxed with stirring for 1.5 g (IXh, g) or 4 h (IXf), during which the color of the solid material changed from colorless to yellow. The mixture was cooled, and the precipitated XIIf-h were washed with water. The products were purified by successive chromatography and crystallization (Table 4).

<u>N-Phenyl-N'-benzoyl-1,8-naphthalenediamine (XIII)</u>. A solution of 0.7 g (5 mmole) of benzoyl chloride in 10 ml of absolute ether was added with stirring in the course of 15 min to a cooled solution of 1.2 g (5 mmole) of N-phenyl-1,8-naphthalenediamine and 0.7 g (7 mmole) of triethylamine in 60 ml of absolute ether, and the mixture was stirred for another 30 min. The ether was then removed by distillation, and the residue was treated with 100 ml of water. The insoluble material was removed by filtration and dried in a vacuum desiccator over CaCl₂. The benzoylation product was purified by chromatography to give 1.2 g (70%) of fine colorless needles with mp 159°C (from octane). IR spectrum: $v_{\rm NH}$ 3370 and $v_{\rm C=0}$ 1668 cm⁻¹. Found: C 81.1; H 5.5; N 8.5%. C₂₃H₁₈N₂O. Calculated: C 81.1; H 5.6; N 8.3%.

<u>1,2-Diphenylperimidine (XIId)</u>. A) Benzoyl-1,8-naphthalenediamine XIII was refluxed in 12% hydrochloric acid for 1 h, after which the mixture was cooled and neutralized with 22% ammonium hydroxide, and the precipitate was removed by filtration, washed with water, and dried to give bright-yellow crystals with mp 239°C (from octane) in quantitative yield.

B) A suspension of 0.37 g (1 mmole) of diacylnaphthalenediamine IXd in 6 ml of 10% aqueous potassium hydroxide was heated on a boiling-water bath for 2 h, after which it was cooled, and the precipitated XIII was removed by filtration and cyclized by method A with hydrochloric acid. The yield of XIId was 0.16 g (50%) based on IXd.

1-Phenyl-2-(o-methoxyphenyl)perimidine was similarly obtained.

Action of Alkali on N-Methoxymethyl-N-formyl-N'-benzoyl-1,8-naphthalenediamine (IXi). A solution of 1.1 g (3 mmole) of IXi in 35 ml of 10% potassium hydroxide solution was stirred on a boiling-water bath for 3 h, after which it was cooled, and the precipitate was removed by filtration and washed with water. The principal reaction product was N-benzoyl-1,8-naphthalenediamine. It was separated by means of preparative TLC [Rf 0.66 on activity IV aluminum oxide (Brockmann scale)]. IR spectrum: $v_{\rm NH}$ 3440 and $v_{\rm C=0}$ 1650 cm⁻¹. 2-Phenylperimidine, with mp 183°C (from alcohol) [11], was obtained by refluxing N-benzoyl-1,8naphthalenediamine with hydrochloric acid.

Action of Hydrochloric Acid on IXi. A solution of 0.4 g (1.2 mmole) of diacylnaphthalenediamine IXi in 10 ml of hydrochloric acid (1:3) was stirred on a boiling-water bath for 30 min, after which it was cooled, and the yellow solution was neutralized with ammonium hydroxide. The precipitate was separated, washed with water, and dried. The yield of the perimidine was 0.2 g (80%). The melting point (222-223°C) and IR spectrum of the product were identical to the characteristics of a genuine sample.

<u>Thermolysis of IXi</u>. A solution of 0.5 g (1.5 mmole) of diacylnaphthalenediamine IXi in 3 ml of o-dichlorobenzene was heated to 150° C and maintained at this temperature for 12 h, after which the o-dichlorobenzene was removed by evaporation at reduced pressure, and the residue was dissolved in chloroform. The 1-methoxymethylperimidine was separated from the decomposition products by TLC to give 0.12 g (38%) of a product with mp 79°C (from octane), in agreement with the melting point for VI.

LITERATURE CITED

- 1. V. V. Kuz'menko and A. F. Pozharskii, Khim. Geterotsikl. Soedin., No. 7, 977 (1978).
- 2. A. K. Sheinkman, A. F. Pozharskii, V. I. Sokolov, and T. V. Stupnikova, Dokl. Akad. Nauk SSSR, 226, 1094 (1967).
- 3. A. F. Pozharskii, I. V. Komissarov, I. T. Filippov, A. A. Konstantinchenko, A. K. Sheinkman, and V. I. Sokolov, Khim.-Farm. Zh., No. 5, 87 (1977).
- 4. A. F. Pozharskii, T. I. Vinokurova, and V. G. Zaletov, Khim. Geterotsikl. Soedin., No.
- 4, 539 (1976).
- 5. A. F. Pozharskii, A. M. Simonov, E. A. Zvezdina, and N. K. Chub, Khim. Geterotsikl. Soedin., No. 5, 889 (1967).
- 6. I. V. Komissarov, A. A. Konstantinchenko, A. F. Pozharskii, I. T. Filippov, and I. S. Kashparov, Khim.-Farm. Zh., No. 7, 28 (1976).
- 7. V. V. Dal'nikovskaya, I. V. Komissarov, I. T. Filippov, and A. F. Pozharskii, Khim.-Farm. Zh. (in press, 1978).
- 8. V. I. Minkin and V. A. Bren', Reakts. Sposobn. Org. Soedin., 4, No. 1, 112 (1967).
- 9. A. F. Pozharskii and I. S. Kashparov, Khim. Geterotsikl. Soedin., No. 1, 111 (1970).
- 10. H. Seebot and A. Rieke, Ann., <u>671</u>, 77 (1964).
- 11. V. Paragamian, M. B. Baker, B. M. Puma, and J. Reale, J. Heterocycl. Chem., <u>5</u>, 59 (1968).