The conditions for the other reactions are given in Table I. During the deprotection of dioxolanes, one can note the formation of a white precipitate, which is solubilized in water at the hydrolysis.

Registry No. **1a**, 10022-28-3; **1b**, 54889-48-4; **1c**, 1125-88-8; **1d**, 2658-60-8; **1e**, 177-10-6; **1f**, 1124-92-1; **1g**, 32622-01-8; **1h**, 86690-13-3; $TiCl_4$, 7550-45-0; LiI, 10377-51-2; octanal, 124-13-0; benzaldehyde, 100-52-7; cyclohexanone, 108-94-1; 5-chloro-3-methyl-2-pentanone, 1187-81-1; 3,5-dimethyl-4-methylene-2-cyclohexen-1-one, 59159-01-2; 3,5-dimethyl-4-[4-[(tetrahydro-2*H*-pyran-2-yl)oxy]-2-butynylidene]-2-cyclohexen-1-one, 86695-79-6.

A New Transformation of Amines to Carbonyl Compounds[1]

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Facile transformation of amines and their derivatives to carbonyl compounds (eq 1) is often an important process

(eq 1)

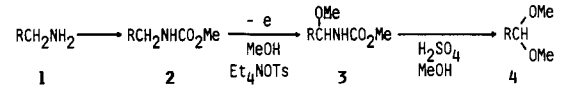
in organic synthesis, while hitherto known methods using oxidizing agents (Ag^{2+},[2] *t*-BuOCl,[3] photochemical,[4] etc.[5]) and nonoxidative methods,[6,7] are not always satisfactory in yields and/or versatility.

In the present paper, we report an application of our continuing study on the anodic oxidation of carbamates[8-12] to the conversion of amines to the corresponding aldehydes or ketones.

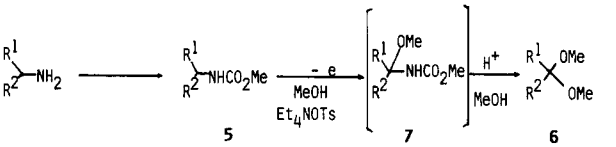
Results and Discussion

As shown in Scheme I, the anodic methoxylation[8] of carbamates **2** prepared from primary amines **1** bearing a primary alkyl group gave α-methoxycarbamates **3** in good yields. The transformation of **3** to dimethyl acetals **4**, was successfully accomplished by the treatment of **4** with 5% H_2SO_4 in methanol.[13]

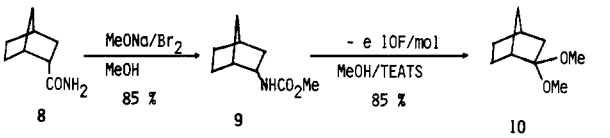
Scheme I



Scheme II



Scheme III



As shown in Table I, this method is useful for the synthesis of dialdehyde from the corresponding dicarbamate and ω-formyl carboxylic acids[15] from ω-amino acids in high yields.

Interestingly, the electrochemical oxidation of carbamates **5** bearing a secondary alkyl group in methanol containing tetraethylammonium *p*-toluenesulfonate (TEATS) as a supporting electrolyte gave directly dimethyl ketals **6** in good yields (Scheme II).

Although there is no concrete evidence to support the intervention of α-methoxylated carbamates **7**, the dimethyl ketals **6** were probably formed by methanolysis of the α-methoxy carbamates **7** catalyzed by acid generated in situ. Typical results are given in Table II.

In addition, the electrochemical method can also be applied to the synthesis of alicyclic ketones that are not necessarily synthesizable easily by the common chemical methods.[17] As exemplified in Scheme III, the anodic oxidation of carbamate **9** synthesized from norbornanecarboxamide (**8**) gave norcamphor dimethyl ketal (**10**) in 85% yield (Scheme III).

In view of its simplicity and versatility, this electrochemical method is undoubtedly one of the promising methods for the transformation of amines to carbonyl compounds.

Experimental Section

Synthesis of Carbamates 2 and 5. Carbamates were prepared from the corresponding amines according to the known methods.[20]

(1) Electroorganic Chemistry. 70.
(2) (a) Bacon, R. G. R.; Hanna, W. J. W. *J. Chem. Soc.* **1965**, 4962. (b) Bacon, R. G. R.; Stewart, D. *J. Chem. Soc. D* **1966**, 1384. (c) Bacon, R. G. R.; Hanna, W. J. W.; Stewart, D. *Ibid.* **1966**, 1388.
(3) Scully, F. E., Jr.; Davis, R. C. *J. Org. Chem.* **1978**, *43*, 1467 and references cited therein.
(4) (a) Hyatt, J. A. *J. Org. Chem.* **1972**, *37*, 1254. (b) Niu, C. H.; Sterberg, V. I. *J. Chem. Soc. D* **1971**, 1430.
(5) (a) Benfield, F. W. S.; Green, M. L. H. *J. Chem. Soc. D* **1971**, 1274. (b) Beech, W. F. *J. Chem. Soc.* **1954**, 1297.
(6) (a) Corey, E. J.; Achiwa, K. *J. Am. Chem. Soc.* **1969**, *91*, 1429. (b) Calo, V.; Lopez, L.; Todesco, P. E. *J. Chem. Soc., Perkin Trans. 1* **1972**, 1652. (c) Katritzky, A. R.; Cook, M. J.; Ikizler, A.; Millet, G. H. *Ibid.* **1979**, 2500. (d) Buckley, T. F.; Rapoport, H. *J. Am. Chem. Soc.* **1982**, *104*, 4446.
(7) Doleschall, G. *Tetrahedron Lett.* **1978**, 2131.
(8) Shono, T.; Hamaguchi, H.; Matusmura, Y. *J. Am. Chem. Soc.* **1975**, *97*, 4264.
(9) Shono, T.; Matsumura, Y.; Tsubata, K. *J. Am. Chem. Soc.* **1981**, *103*, 1172.
(10) Shono, T.; Matusmura, Y.; Tsubata, K.; Takata, J. *Chem. Lett.* **1981**, 1121.
(11) Shono, T.; Matsumura, Y.; Tsubata, K. *Tetrahedron Lett.* **1981**, *22*, 2411.
(12) Shono, T.; Matsumura, Y.; Tsubata, K. *Tetrahedron Lett.* **1981**, *22*, 3249.
(13) Mitzlaff has reported[14] that the treatment of α-methoxy-*N*-acylazacycloalkanes with methanol gave a small amount of the corresponding dimethyl acetals or ketals.
(14) Mitzlaff, M.; Warning, K.; Jensen, H. *Liebigs Ann. Chem.* **1978**, 1713.
(15) Some ω-formyl carboxylic acid derivatives have been prepared by the anodic oxidation[16] of the corresponding lactams.
(16) Warning, K.; Mitzlaff, M. *Tetrahedron Lett.* **1979**, 1563.
(17) Although a variety of synthetic methods of norcamphor[18] or dehydronorcamphor[18b,19] have been reported, the methods are not always practical.
(18) (a) Kleinfelter, D. C.; Schleyer, P. v. R. *Org. Synth.* **1962**, *42*, 79. (b) Alder, K.; Rickert, H. F. *Justus Liebigs Ann. Chem.* **1940**, *9*, 543. (c) Bhati, A. *Perfum. Essent. Oil Record* **1962**, *53*, 223. (d) Moskvichev, V. I.; Kheifis, L. A. *Zh, Org. Khim.* **1973**, *9*, 1444.
(19) (a) Bartlett, P. D; Tate, B. E. *J. Am. Chem. Soc.* **1956**, *76*, 2473. (b) Roberts, J. D.; Trumbull, E. R., Jr.; Bennett, W.; Armstrong, R. *J. Am. Chem. Soc.* **1950**, *72*, 3116. (c) Trost, B. M.; Tamaru, Y. *J. Am. Chem. Soc.* **1975**, *97*, 3528.
(20) (a) Kraft, W. M.; Herbert, R. M. *J. Org. Chem.* **1945**, *10*, 483. (b) Corey, E. J.; Bock, M. G.; Kozikowski, A. P.; Rama Rao, A. V.; Floyd, D.; Lipshutz, B. *Tetrahedron Lett.* **1978**, 1051.

0022-3263/83/1948-3338$01.50/0

Table I. Synthesis of Dimethyl Acetals

	carbamate 2	methoxycarbamate 3; yield,[a] %	product 4; yield,[a] %
1	*n*-BuNHCO$_2$Me (**2a**)	**3a** 72	*n*-PrCH(OMe)$_2$ (**4a**) 85
2	*n*-C$_6$H$_{13}$NHCO$_2$Me (**2b**)	**3b** 72	*n*-C$_5$H$_{11}$CH(OMe)$_2$ (**4b**) 92
3	*n*-C$_8$H$_{17}$NHCO$_2$Me (**2c**)	**3c** 75	*n*-C$_7$H$_{15}$CH(OMe)$_2$ (**4c**) 93
4	MeOOCNH—(CH$_2$)$_6$—NHCO$_2$Me (**2d**)	**3d**[b] 77	(MeO)$_2$CH—(CH$_2$)$_4$—CH(OMe)$_2$ (**4d**) 74
5	MeOOCNH—(CH$_2$)$_5$CO$_2$Me (**2e**)	**3e** 85	MeO(O)C—(CH$_2$)$_4$—CH(OMe)$_2$ (**4e**) 88
6	MeOOCNH—(CH$_2$)$_3$—CO$_2$Me (**2f**)	**3f** 65	MeO(O)C(CH$_2$)$_2$—CH(OMe)$_2$ (**4f**) 89
7	*i*-C$_3$H$_7$O—(CH$_2$)$_3$NHCO$_2$Me (**2g**)	**3g** 92	*i*-PrO—(CH$_2$)$_2$—CH(OMe)$_2$ (**4g**) 90

[a] Isolated yields. [b] 6F/mol of electricity was passed.

Table II. Synthesis of Dimethyl Acetals

carbamate 5	dimethyl ketal 6	yield,[a] %
CH$_3$CH(CH$_2$)$_5$CH$_3$ (NHCO$_2$Me) **5a**	CH$_3$C(CH$_2$)$_5$CH$_3$ (OMe, OMe) **6a**	78
 **5b**	 **6b**	69
CH$_3$CHCH$_2$CH$_3$ (NHCO$_2$Me) **5c**	CH$_3$CCH$_2$CH$_3$ (OMe, OMe) **6c**	72

[a] Isolated yields.

Electrochemical Oxidation of Carbamates 2 to 3. General Procedure. The preparative electrolysis was carried out according to the previously reported procedure.[8] Into a 50-mL electrolysis cell equipped with two carbon electrodes was placed a methanolic solution (30 mL) of carbamate **2** (0.05 mol) and tetraethylammonium *p*-toluenesulfonate (0.005 mol). After 3 F/mol of electricity (0.5 A) was passed through the cell, the reaction mixture was poured into 100 mL of water and extracted with three portions of ether.

The combined ethereal layer was dried over $MgSO_4$ and evaporated. The products were isolated by distillation (**3a–c**, **3e–g**) or column chromatography (**3d**) (silica gel, EtOAc).

3a: bp 93–97 °C (17 mmHg); IR (neat) 3350, 2830, 1695, 1530, 1250 cm^{-1}; NMR (CCl_4) δ 5.4–4.33 (m, 2 H), 3.6 (s, 3 H), 3.2 (s, 3 H), 1.73–0.65 (m, 7 H). Anal. Calcd for $C_7H_{15}NO_3$: C, 52.15; H, 9.38. Found: C, 52.38; H, 9.60.

3b: bp 85–89 °C (1.5 mmHg); IR (KBr) 3400, 2820, 1690, 1520, 1250 cm^{-1}; NMR (CCl_4) δ 5.4–4.35 (m, 2 H), 3.65 (s, 3 H), 3.2 (s, 3 H), 1.75–0.7 (m, 11 H). Anal. Calcd for $C_9H_{19}NO_3$: C, 57.11; H, 10.12. Found: C, 57.39; H, 10.01.

3c: bp 110–115 °C (2 mmHg); IR (KBr) 3400, 2820, 1685, 1530, 1250 cm^{-1}; NMR (KBr) δ 5.4–4.3 (m, 2 H), 3.6 (s, 3 H), 3.23 (s, 3 H), 1.8–0.7 (m, 15 H). Anal. Calcd for $C_{11}H_{23}NO_3$: C, 60.80; H, 10.67. Found: C, 60.75; H, 10.80.

3d: IR (KBr) 3400, 2820, 1690, 1530, 1260, 1090 cm^{-1}; NMR (CCl_4) δ 5.3 (m, 2 H), 4.9–4.5 (m, 2 H), 3.57 (s, 6 H), 3.21 (s, 6 H), 1.85–1.0 (m, 8 H). Anal. Calcd for $C_{12}H_{24}N_2O_6$: C, 49.30; H, 8.28; N, 9.58. Found: C, 49.53; H, 8.15; N, 9.50.

3e: bp 128–130 °C (0.8 mmHg); IR (KBr) 3350, 2850, 1710, 1620, 1240, 1080 cm^{-1}; NMR (CCl_4) δ 5.6–4.4 (m, 2 H), 3.58 (s, 6 H), 3.25 (s, 3 H), 2.3 (t, 3 H), 2.0–1.0 (m, 6 H). Anal. Calcd for $C_{10}H_{19}NO_5$: C, 51.49; H, 8.21, N, 6.01. Found: C, 51.49; H, 8.07; N, 6.00.

3f: bp 113–115 °C (0.9 mmHg); IR (neat) 3350, 2830, 1700, 1540, 1260, 1100 cm^{-1}; NMR (CCl_4) δ 5.7 (m, 1 H), 4.7 (m, 1 H), 3.65 (s, 6 H), 3.31 (s, 3 H), 2.5–1.6 (m, 4 H). Anal. Calcd for $C_8H_{15}NO_5$: C, 46.82; H, 7.37; N, 6.83. Found: C, 46.71; H, 7.45; N, 6.67.

3g: bp 85–87 °C (0.8 mmHg); IR (neat) 3350, 2850, 1690, 1540, 1250, 1080 cm^{-1}; NMR (CCl_4) δ 6.3–5.8 (m, 1 H), 5.1–4.65 (m, 1 H), 3.91–3.0 (m, 3 H), 3.62 (s, 3 H), 3.3 (s, 3 H), 2.0–1.5 (m, 2 H), 1.3 (d, 6 H). Anal. Calcd for $C_9H_{19}NO_4$: C, 52.66; H, 9.33; N, 6.82. Found: C, 52.50; H, 9.19; N, 7.01.

Synthesis of Dimethyl Acetals 4 in General. α-Methoxylated carbamates **3** (0.05 mol) were treated with methanol (20 mL) containing 5% H_2SO_4 at room temperature. After being stirred for 3 h, the mixture was poured into a saturated aqueous solution (100 mL) of $NaHCO_3$ and extracted twice with ether. The combined organic layer was dried over $MgSO_4$ and evaporated under atmospheric pressure.

All products were isolated through a silica gel column using a mixed solvent of hexane and ethyl acetate (5:1) and identified by spectroscopic methods and/or comparison with the authentic samples[21] (**4a–c**).

4a: IR (neat) 2820, 1120 cm^{-1}; NMR (CCl_4) δ 4.3 (t, 1 H), 3.23 (s, 6 H), 1.76–0.7 (m, 7 H); MS, *m/e* 118 (M$^+$).

4b: IR (neat) 2825, 1120, 1050 cm^{-1}; NMR (CCl_4) δ 4.27 (t, 1 H), 3.25 (s, 6 H), 1.77–0.7 (m, 11 H); MS, *m/e* 146 (M$^+$).

4c: IR (neat) 2820, 1120, 1055 cm^{-1}; NMR (CCl_4) δ 4.3 (t, 1 H), 3.23 (s, 6 H), 1.8–0.7 (m, 15 H); MS, *m/e* 174 (M$^+$).

4d: IR (neat) 2825, 1120, 1050 cm^{-1}; NMR (CCl_4) υ 4.3 (t, 2 H), 3.3 (s, 12 H), 2.02–0.99 (m, 8 H); MS, *m/e* 206 (M$^+$). Anal. Calcd for $C_{10}H_{22}O_4$: C, 58.23; H, 10.75. Found: C, 58.20; H, 10.65.

4e: IR (neat) 2825, 1735, 1125 cm^{-1}; NMR (CCl_4) δ 4.25 (t, 1 H), 3.6 (s, 3 H), 3.2 (s, 6 H), 2.25 (t, 2 H), 1.85–0.9 (m, 6 H); MS, *m/e* 190 (M$^+$). Anal. Calcd for $C_9H_{18}O_4$: C, 58.62; H, 9.54. Found: C, 58.72; H, 9.35.

4f: IR (neat) 2820, 1120, 1060 cm^{-1}; NMR (CCl_4) δ 4.3 (t, 1 H), 3.63 (s, 3 H), 3.3 (s, 6 H), 2.5–1.6 (m, 4 H); MS, *m/e* 162 (M$^+$). Anal. Calcd for $C_7H_{14}O_4$: C, 51.84; H, 8.70. Found: C, 51.58; H, 8.59.

4g: IR (neat) 2825, 1120, 1070 cm^{-1}; NMR (CCl_4) δ 4.4 (t, 1 H), 3.75–3.2 (m, 3 H), 3.28 (s, 6 H), 1.7 (q, 2 H), 1.1 (d, 6 H); MS, *m/e* 162 (M$^+$). Anal. Calcd for $C_8H_{18}O_3$: C, 59.23; H, 11.18. Found: C, 59.40; H, 11.02.

Electrochemical Oxidation of Carbamates 5 to 6. Anodic oxidation of carbamates **5** was carried out according to the same procedure described above. After 15 F/mol of electricity was passed through the cell, the products **6** were isolated and identified by comparison with authentic samples prepared from the corresponding ketones.[22]

6a: IR (neat) 2820, 1130, 1100 cm^{-1}; NMR (CCl_4) δ 3.08 (s, 6 H), 1.8–1.12 (m, 10 H); MS, *m/e* 144 (M$^+$).

6b: IR (neat) 2825, 1120, 1100 cm^{-1}; NMR (CCl_4) δ 3.03 (s, 6 H), 1.43 (t, 2 H), 1.1 (s, 3 H), 1.8 (t, 3 H); MS, *m/e* 118 (M$^+$).

6c: IR (neat) 2820, 1100 cm^{-1}; NMR (CCl_4) δ 3.05 (s, 6 H), 1.75–0.68 (m, 13 H), 1.08 (s, 3 H); MS, *m/e* 172 (M$^+$).

Transformation of 8 to 10. The Hofmann rearrangement[23] of norbornanecarboxamide[24] (**8**) in methanol gave carbamate **9** in 85% yield. The anodic oxidation of **9** to **10** was easily accomplished by passing 10 F/mol of electricity according to the general procedure.

9: IR (KBr) 3320, 1680, 1530, 1260 cm^{-1}; NMR (CCl_4) δ 5.4-4.33 (m, 1 H), 3.63 (s, 3 H), 4.2–3.2 (m, 1 H), 2.62–1.0 (m, 12 H). Anal. Calcd for $C_9H_{15}NO_2$: C, 63.88; H, 8.93. Found: C, 63.70; H, 8.82.

10: IR (neat) 2820, 1100 cm^{-1}; NMR (CCl_4) δ 3.06 (s, 3 H), 3.03 (s, 3 H), 2.33–0.8 (m, 10 H); MS, *m/e* 156 (M$^+$). Anal. Calcd for

(21) The authentic samples of **4a–c** were prepared from the corresponding aldehydes according to the usual method.

(22) Commercially available 2-octanone, cyclohexanone, and 2-butanone were used for the synthesis of dimethyl ketals **6a–c**.

(23) Adams, R. *Org. React.* (*N.Y.*) **1959**, *13*, 283.

(24) Boehme, W. R. *J. Am. Chem. Soc.* **1958**, *80*, 4740.

$C_9H_{16}O_2$: C, 69.19; H, 10.32. Found: C, 68.98; H, 10.60.

Registry No. **2a**, 2594-21-0; **2b**, 22139-32-8; **2c**, 36598-10-4; **2d**, 6030-54-2; **2e**, 70288-80-1; **2f**, 70288-77-6; **2g**, 86688-70-2; **3a**, 76469-96-0; **3b**, 86688-71-3; **3c**, 86688-72-4; **3d**, 86688-73-5; **3e**, 86688-74-6; **3f**, 86688-75-7; **3g**, 86688-76-8; **4a**, 4461-87-4; **4b**, 1599-47-9; **4c**, 10022-28-3; **4d**, 54286-89-4; **4e**, 25176-55-0; **4f**, 4220-66-0; **4g**, 86688-77-9; **5a**, 86688-78-0; **5b**, 5817-68-5; **5c**, 39076-02-3; **6a**, 54583-19-6; **6b**, 933-40-4; **6c**, 3453-99-4; **8**, 76649-94-0; **9**, 86709-30-0; **10**, 10395-51-4.

Facile Synthesis of 5-Acyl-4-amino-2-ethoxythiazoles from an [Ethoxy(thiocarbonyl)]cyanamide Salt and α-Halo Ketones

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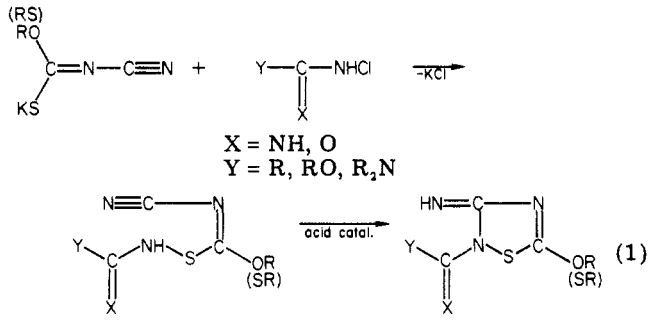
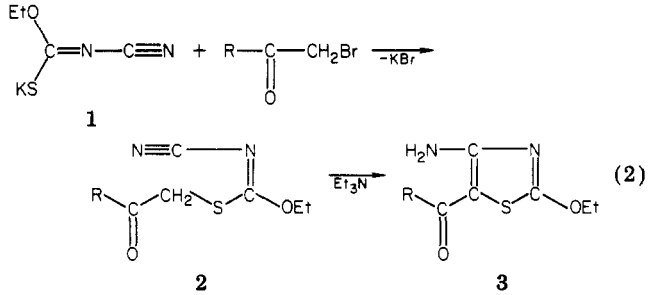
In the course of our synthetic studies[1-4] of heterocyclic compounds using cyanamide derivatives, we found that Δ^4-1,2,4-thiadiazoline derivatives were easily prepared by the reaction of potassium [alkoxy(thiocarbonyl)]cyanamide and potassium methyl *N*-cyanodithiocarbonimidate with *N*-halo compounds (eq 1). We have now extended this



(1)

process to provide a facile synthesis of 5-acyl-4-amino-2-ethoxythiazoles using potassium [ethoxy(thiocarbonyl)]-cyanamide (1) and α-halo ketones instead of *N*-halo compounds. Although several types 2-aminothiazoles are known, relatively few synthetic studies on 4-aminothiazoles have been reported.

α-Bromoacetophenone readily reacted with **1** to provide an open-chain intermediate **2a** (eq 2) that showed two



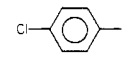
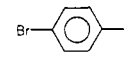
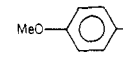
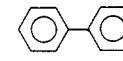
1

2 3

(2)

strong IR absorptions of a nitrile group around 2200 cm^{-1}.

Table I. Synthesis of 5-Acyl-4-amino-2-ethoxythiazoles (3)[a]

compd	R	yield, %	mp, °C	recrystn solvent
3a	Ph	97	87–88	MeOH
3b		100	121–122	MeOH
3c		95	129–130	MeOH
3d		99	87–88	MeOH(aq)
3e		100	157–158	C_6H_6
3f	Me	90	121–122	MeOH

[a] Satisfactory analyses (±0.3 for C, H, and N) consistent ^{1}H NMR spectra (Et, NH_2, Ar signals) were reported for all compounds.

Although **2a** did not cyclize on heating in acetone or ethanol, it was converted into 4-amino-5-benzoyl-2-ethoxythiazole (**3a**) in high yield by treatment with triethylamine at room temperature. We found that the initial condensation and subsequent cyclization could be run in sequence in acetone at room temperature without isolating the intermediate **2**. Several 4-aminothiazoles were thus prepared from α-bromo ketones in excellent yields, as shown in Table I.

In a similar manner, bis(4-amino-2-ethoxy-5-thiazolyl) ketone (**3g**) was easily synthesized in a good yield from 2 equiv of **1** and 1,3-dichloro-2-propanone.

The structures of **3** were confirmed by elemental analyses and mass, ^{1}H NMR, and IR spectral data. In the IR spectra, the absorption of the carbonyl group of **3** appears around 1620 cm^{-1}, which is a much lower frequency than that of ordinary ketones and probably reflects intramolecular hydrogen bonding between the carbonyl and amino groups.[5]

The cyclization of **2** seems to proceed via a carbanion intermediate, which is stabilized by the carbonyl group and sulfur atom.

Experimental Section

Melting points are uncorrected. ^{1}H NMR spectra were recorded at 60 MHz on a Hitachi R24B spectrometer with Me_4Si as an internal standard. IR spectra were obtained on a Hitachi 295 infrared spectrometer. Electron-impact mass spectra were determined at 75 eV on a JEOL JMS-D100 mass spectrometer by direct introduction via solid probe.

Typical Procedure for the Preparation of Thiazoles. Preparation of 4-Amino-5-benzoyl-2-ethoxythiazole (3a). To a stirred solution of 0.84 g (5 mmol) of potassium [ethoxy(thiocarbonyl)]cyanamide salt **1**[6] in 8 mL of acetone was gradually added a solution of 1.00 g (5 mmol) of phenacyl bromide in 2 mL of acetone at room temperature. After about 1 h of stirring, 0.3 mL of triethylamine was added to the reaction mixture. After an additional 1 h of stirring, the reaction mixture was evaporated to dryness under reduced pressure. The residue was mixed with water, and insoluble material was collected by filtration: yield 1.20 g (97%); mp 87–88 °C. Recrystallization from methanol provided 0.90 g (73%) of pure **3a** as a white solid: mp 87–88 °C; IR (KBr) 1610 cm^{-1} (C=O); NMR ($CDCl_3$) δ 1.40 (t, 3 H, J = 7 Hz, CH_3), 4.40 (q, 2 H, J = 7 Hz, CH_2), 7.10 (s, 2 H, NH_2), 7.53 (m, 5 H, C_6H_5); MS, m/e 248 (M^+).

Preparation of Bis(4-amino-2-ethoxy-5-thiazolyl) Ketone (3g). In a similar manner as for the preparation of **3a**, the reaction was carried out by using 0.84 g (5 mmol) of **1**, 0.32 g (2.5 mmol)

(1) Fuchigami, T.; Odo, K. *Bull. Chem. Soc. Jpn.* **1975**, *48*, 310.
(2) Fuchigami, T.; Odo, K. *Bull. Chem. Soc. Jpn.* **1976**, *49*, 3165.
(3) Fuchigami, T.; Nonaka, T.; Odo, K. *Bull. Chem. Soc. Jpn.* **1976**, *49*, 3170.
(4) Fuchigami, T.; Nonaka, T. *Chem. Lett.* **1979**, 829.
(5) The ^{1}H NMR signal of NH_2 group of **3** did not disappear completely right after D_2O was added to the solution of **3**.
(6) Suyama, T.; Odo, K. *J. Synth. Org. Chem. Jpn.* **1971**, *29*, 65.

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