Preparation of 2-Alkoxyimino Aldehydes and Ketones by the Oxidation of Alkoxyiminoalkanes with Selenium Dioxide[1]

Larry A. Sternson[2] and Dominick A. Coviello*

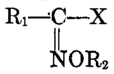
Department of Medicinal Chemistry, College of Pharmacy,
University of Illinois at the Medical Center,
Chicago, Illinois 60612

Received June 25, 1971

Two 2-alkoxyiminoaldehydes have been prepared in low yield by reduction of the corresponding 2-alkoxyiminoacyl halides with lithium tri-*tert*-butoxyaluminohydride.[3] 2-Alkoxyimino ketones have not been reported, however.

Table I

Compounds Prepared by the SeO_2 Oxidation of Alkoxyiminoalkanes



$R_1\text{—}C(\text{=NOR}_2)\text{—}X$

Registry no.	R_1	R_2	X	Bp, °C (Torr)	Refractive index	Yield, %	Composition	Calcd, % C	Calcd, % H	Calcd, % N	Found, % C	Found, % H	Found, % N
32349-36-3	Ph	Me	CHO	63–65 (0.035)	n^{20}D 1.5455	49	$C_9H_9NO_2$[a]	54.09	5.41	24.54	54.32	5.33	24.92
32349-37-4	Ph	Et	CHO	59–61 (0.002)	n^{24}D 1.5380	60	$C_{10}H_{11}NO_2$[b]	56.41	5.98	23.93	56.65	5.68	23.85
32349-39-6	EtCO	Et	H	132–134	n^{24}D 1.4318	33	$C_6H_{11}NO_2$	55.81	8.53	10.85	55.54	8.72	10.65

[a] Analyzed as semicarbazone ($C_{10}H_{12}N_4O_2$), mp 195°, registry no. 32382-33-5. [b] Analyzed as semicarbazone ($C_{11}H_{14}N_4O_2$), mp 175°, registry no. 32349-38-5.

Imine nitrogens in heteroaromatic systems like carbonyls cause adjacent methylenes to become oxidized to aldehydes or ketones by SeO_2. In these systems, however, the corresponding acid derivatives have a great propensity to form.[4,5]

In an effort to develop a general procedure for introducing a carbonyl adjacent to an alkoxyimino function, *O*-alkyl oximes were treated with SeO_2. Ethers (methyl and ethyl) of acetophenone oxime were oxidized to the desired aldehydes in good yield. The corresponding free oximes produced tar. The *O*-ethyl ether of butyraldoxime was readily oxidized to 2-oxobutyraldoxime *O*-ethyl ether. The compounds prepared are shown in Table I with pertinent physical and analytical data.

When the *O*-ethyl ethers of purely aliphatic compounds like acetone and 3-methyl butanone were treated with SeO_2 in ethanol they yielded mainly ethyl esters of the corresponding 2-alkoxyimino acids. Spectral and chemical evidence confirmed the presence of the esters (see Experimental Section). Ester formation apparently results from an acid-catalyzed condensation between the carboxylic acids generated and the solvent (ethanol).

In the case of acetone oxime *O*-ethyl ether, running the reaction without solvent or in a mixture of dioxane and water produced no aldehyde.

Experimental Section

General Procedure.—The optimum conditions varied from compound to compound, but the general procedure involved heating equimolar quantities of selenium dioxide and the oxime ether in a solution of *p*-dioxane and water (8:1) at reflux for 4.5 hr. Filtration of the reaction mixture to remove selenium was followed by removal of solvent and distillation of the residue.

Characterization of Esters.—When acetone oxime *O*-ethyl ether was treated with selenium dioxide in alcohol–water at reflux the product, bp 70–72° (15 Torr), n^{26}D 1.4540, showed no aldehydic proton in the nmr. It did show a weak carbonyl bond at 1735 cm^{-1} (film) in the ir and a parent ion at *m/e* 159 in the mass spectrum. Basic hydrolysis of the product yielded a white solid which was identified as 2-ethoxyiminopropionic acid, mp 68–70° (lit.[6] 68–70°).

In like manner ethyl 2-ethoxyimino-3-methylbutanoate, bp 64–66° (13 Torr), n^{26}D 1.4339, was obtained from 2-ethoxyimino-3-methylbutanone. No aldehydic proton was observed in the nmr, but there was a weak carbonyl at 1730 cm^{-1} (film) in the ir and a parent ion at *m/e* 187 in the mass spectrum.

Registry No.—SeO_2, 7446-08-4.

---

[1] Abstracted in part from the Ph.D. dissertation of L. A. S., University of Illinois, 1971.

[2] Department of Medicinal Chemistry, University of Kansas, Lawrence, Kans.

[3] D. A. Coviello and W. H. Hartung, *J. Org. Chem.*, **24**, 1611 (1959).

[4] A. Burger and L. R. Modlin, *J. Amer. Chem. Soc.*, **62**, 1079 (1940).

[5] W. Henze, *Ber.*, **67**, 750 (1934).

[6] A. F. Ferris, *J. Org. Chem.*, **24**, 1726 (1959).

Hückel Molecular Orbital Calculations of the Index of Aromatic Stabilization of Polycyclic Conjugated Molecules[1,2]

M. Milun, Ž. Sobotka, and N. Trinajstić*

Institute "Rugjer Bošković," 41000 Zagreb, Croatia, Yugoslavia

Received April 20, 1971

In recent years there have been various attempts[3-7] to improve the predictive power of the HMO method originated by Hückel[8] in 1931. Here we would like

---

[1] Presented in part at the Meeting of Croatian Chemists, Zagreb, Croatia, Yugoslavia, Feb 1971.

[2] This note was based upon B.S. theses submitted by M. Milun and Ž. Sobotka in partial fulfillment of the requirements for the B.S. degree at the Croatian University, Zagreb, 1971.

[3] H. P. Figeys and P. Dedieu, *Theor. Chim. Acta*, **9**, 82 (1967).

[4] H. P. Figeys, *Tetrahedron*, **26**, 4615, 5225 (1970).

[5] J. Kruszewski and T. M. Krygowski, *Tetrahedron Lett.*, 319 (1970).

[6] T. M. Krygowski, *ibid.*, 1311 (1970).

[7] J. Kuthan and T. M. Krygowski, *ibid.*, 4109 (1970).

[8] E. Hückel, *Z. Phys.*, **70**, 204 (1931); **72**, 310 (1931); **76**, 628 (1932).