

A GENERAL SYNTHESIS OF α,β -UNSATURATED α -AMINO ACID ETHYL ESTERS

Chung-gi SHIN,* Yasuchika YONEZAWA, and Juji YOSHIMURA**

Laboratory of Organic Chemistry, Kanagawa University, Kanagawa-ku, Yokohama 221

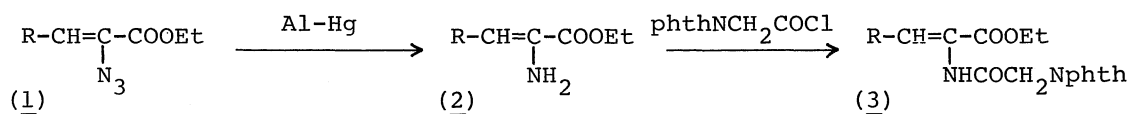
**Laboratory of Chemistry for Natural Products, Tokyo Institute of Technology,
Meguro-ku, Tokyo 152

The general synthesis of ethyl 2-amino-2-alkenoate by reduction of ethyl 2-azido-2-alkenoate, derived from ethyl 2-alkenoate by four steps, with aluminum-amalgam is described.

It has been widely recognized that α,β -unsaturated α -amino acids (N-unsubstituted- α -dehydroamino acids) are of great importance as the starting materials of dehydropolypeptides and particular peptides which are important substances as antibiotics.¹⁾

In previous papers, a few synthetic method of ethyl 2-amino-2-alkenoate (2) has been tried, but, they gave not always satisfied results. For examples, reduction of alkyl 2-nitro-2-alkenoate with aluminum-amalgam (Al-Hg) gave only the corresponding oximes,²⁾ except alkyl 2-amino-3-methyl-2-butenate,^{3,4)} and successive hydrogenation and pyrolysis of alkyl 2-nitro-3-methoxyalkanoate gave 2 only in a low yield, together with the corresponding hydroxyamine as the main product.²⁾

Moreover, ethyl 2-imino-3-methylbutanoate, obtained by the reaction of ethyl 2-oxo-3-methylbutanoate with triphenylphosphinimine in a good yield, could not isomerize into the corresponding enamine.⁵⁾



a; R=CH₃, b; R=C₂H₅, c; R=n-C₃H₇, d; R=i-C₃H₇, e; R=C₆H₅

In this paper, we wish to report that the reduction of ethyl 2-azido-2-

alkenoate (1), derived from ethyl 2-alkenoate by four steps,⁶⁾ with Al-Hg gave 2 in a good yield. Several attempts of selective catalytic reduction gave only intractable products or over-hydrogenated products.

The typical preparation has been done as follows: A solution of 1 (0.03 mol) in ether (10 ml) was added drop by drop into a suspension of Al-Hg (from 3.5 g of aluminum) in ether (50 ml) with vigorous stirring at room temperature. After a few minutes, the ether began to reflux, the state was maintained by addition of a few drops of water at 20-min intervals. After addition of the solution was completed, the stirring was continued for 3 hr. The mixture was extracted thoroughly several times with ether-ethyl acetate (1 : 3 V/V). The combined extracts were evaporated and then distilled under reduced pressure to give 2 as a colorless oil in ca. 80% yield.

The structure of 2 was characterized spectroscopically as shown in Table 1 and gave satisfactory results in elementary analysis.

Moreover, 2 was converted into the corresponding phthaloylglycyl derivatives (3), which were identical with the authentic samples.²⁾

Table 1. Ethyl 2-amino-2-alkenoate (2)

Compound R	Yield (%)	Bp °C/mmHg	IR spectrum, ^{a)} cm ⁻¹			NMR spectrum, ^{b)} ppm	
			NH ₂	COOEt	C=C	β-H (Hz)	NH
<u>2a</u> CH ₃	75.6	40-41/1.5	3450, 3360, 1714, 1658			5.65q(7.2), 3.50	
<u>2b</u> C ₂ H ₅	85.7	50-52/1.5	3450, 3350, 1711, 1650			5.56t(7.1), 3.45	
<u>2c</u> n-C ₃ H ₇	80.0	58-60/0.3	3450, 3360, 1715, 1650			5.59t(7.3), 3.50	
<u>2d</u> i-C ₃ H ₇	84.5	55-58/1.0	3450, 3350, 1712, 1645			5.46d(9.1), 3.52	
<u>2e</u> C ₆ H ₅	70.9	90-95/0.5	3440, 3350, 1711, 1632			6.50s,	4.30

a) Recorded in KBr disk. b) Measured in CDCl₃.

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