REACTIONS OF ISOCYANIDES. II - ADDITION TO ACETALS

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Summary : In the presence of TiCl_{μ}, tert-butyl isocyanide reacts with aldehyde acetals to afford β -alkoxycyanoenamines.

Isocyanides, stable divalent carbon compounds are widely utilized as nucleophiles as well as electrophiles (1). Therefore, many reports have been published about the reaction of isocyanides with carbocation species (1, 2, 3).

The reaction of acetals with isocyanides in the presence of TiCl₄ leads to α -alkoxycarboxamide derivatives <u>2</u> (4, 5, 6) or to cyanohydrin ethers <u>3</u> (7) (Scheme 1).



In this communication, we wish to report on the nucleophilic addition of isocyanides to the highly electrophilic carbon of the imidoyl intermediate <u>1</u>.

The reaction of several aldehyde acetals, each with two equivalents of tert-butylisocyanide and one equivalent of TiCl₄ (8), leads essentially to a new class of compounds, β -alkoxycyanoenamines 4, along with two minor by-products, α -alkoxycarboxamides 5 and α -chloroethers 6 (Scheme 2).

Scheme 2



Table R¹ (CH3),CH сн, Н С,Н5 C₃H₇ C₆H₁₃ C₆H₅ Н Acetal н н н н н н R³ сн, сн, СН3 сн, СН, CH, с,н, 57 69 57 65 36 50 52 4 0 _ 7 30 1 Yield 14 8 4.5 1.5 1 14 12 8.5

We have not yet optimized the reaction conditions. Nevertheless, we have prepared in fair to good yields (Table) a new class of substituted enamines (9) from readily available starting materials (10).

These β -alkoxycyanoenamines, which constitutes a special case of push-pull olefins, offer a promising role as synthetic building blocks. Consequently, their chemical reactivity is now under investigation in our laboratory.

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8 - The general procedure is described below :

To a stirred solution of tert-butylisocyanide (3 mmol) and aldehyde acetal (1 mmol) in anhydrous methylene chloride (10 mL) is added dropwise a solution of TiCl_4 (1.2 mmol) in methylene chloride (10 mL) at -50°C under an argon atmosphere. The reaction mixture is allowed to warm to room temperature and further stirred for 3 h. It is then poured in a saturated aqueous potassium carbonate solution. After usual work-up, the cyanoenamine is purified by chromatography on a silica gel column.

 $R^{1} = Et$; $R^{2} = H$; $R^{3} = Me$: I.R. (neat): 3320, 2940, 2880, 2210, 1645; ¹H NMR (CDC1₃): 1.15 (t, 3H); 1.20 (s, 9H); 2.55 (q, 2H); 3.73 (s, 3H). Anal.: Calcd. for C₁₀H₁₈N₂₀: C, 65.90; H, 9.95; N, 15.37. Found: C, 65.23; H, 9.62; N, 15.42.

9 - For the synthesis and reactivity of α-cyanoenamines, see : N. DEKIMPE, R. VERHE, L. DEBUYCK, N. SCHAMP, Synthesis (1979) 741.

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