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A NEW DIENAMINE SYNTHESIS;

THE AMIDE ACETAL CLAISEN REARRANGEMENT OF ALKYNYL ALLYLIC ALCOHOLS

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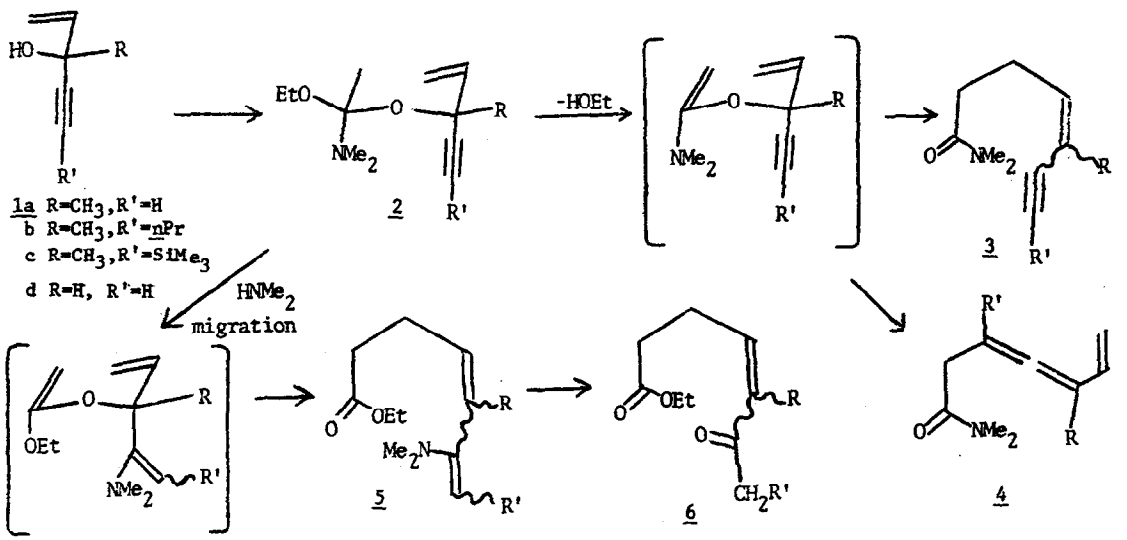
In an earlier communication,[1] we reported the stereoselective synthesis of several acyclic enynes by the orthoester Claisen rearrangement of allylic propargylic alcohols. In an effort to improve both yield and stereoselectivity in this type of reaction, we investigated the reaction of alcohol 1a with dimethylacetamide diethyl acetal.[2]

Condensation of 1a with this reagent affords no trace of the "normal" Claisen product, amide 3a, but rather dienamine 5a, which is easily converted to ketone 6a.[3]



We investigated the generality of this unexpected transformation by analyzing the products of alcohols 1b-d. In a typical procedure, the alcohol, in an excess of neat dimethylacetamide diethyl acetal, was heated at 110-118° for three hours.[3] The product mixture was chromatographed on a silica gel column which had been pre-treated with 10% water, and distilled over a short path.

Product analyses were performed using gas chromatography (15' x 1/4" column, 20% Carbowax 20M on Diatoport S and/or 20' x 1/4" column, 20% SE30 on Chromosorb W, acid-washed DMCS). Product distributions and yields are reported in the Table.

Table

Product Distributions from the Amide Acetal Claisen Rearrangement of Alkynyl Allylic Alcohols

	% Product		
Alcohol	3	4	6
1a	---	---	69%
1b	56%	---	---
1c	45%	8%	---
1d	37%	---	14%

In the "normal" amide acetal Claisen rearrangement,[2] ethanol is lost from the amide acetal moiety in 2; the resulting intermediate can undergo thermal rearrangement to give products of general structure 3 and/or 4. In the case of alcohol 1a, however, and to some extent that of 1d, the course of this elimination is altered to one in which dimethylamine is lost from the amide acetal group and added across the acetylene. These results are consistent with a mechanism in which the dimethylamino group adds to the acetylenic bond in a nucleophilic, intramolecular process[5] which becomes more facile when the acetylenic bond is forced by larger geminal groups into proximity with the dimethylamino group.

A study of the reactions of simple propargyl alcohols with dimethylacetamide diethyl acetal is reported in a forthcoming communication.

References

1. K. A. Parker and R. W. Kosley, Jr., Tetrahedron Letters, 691 (1975); see also P. Cresson, C. R. Acad. Sc. Paris, t. 273, 1382 (1971).

2. See footnote 1 in W. S. Johnson, et al., J. Amer. Chem. Soc., 92, 741 (1970).

3. An independent synthesis from ethyl 4-oxobutyrate (E. R. H. Jones, H. H. Lee, and M. C. Whiting, J. Chem. Soc., 3483 (1960)) was accomplished according to the method of H. J. Bestmann and B. Arnason, Chem. Ber., 95, 1513 (1962).

4. Dienamine 5a was isolated by distillation at 79-84° (0.6 mm): $\lambda_{max}^{CHCl_3}$ 1730, 1645-1565 cm^{-1}; δ= 1.28 (3H, triplet, J=7 Hz), 1.80 (3H, singlet), 2.54 (10H, multiplet), 3.70 (1H, singlet), 3.88 (1H, singlet), 4.12 (2H, quartet, J=7 Hz) and 5.59 (1H, triplet, J=7 Hz) ppm.

5. A similar intramolecular addition across an acetylenic bond has been reported by T. Metler, A. Uchida, and S. I. Miller, Tetrahedron, 24, 4285 (1968).