ON THE FACILE AND CONVENIENT SYNTHESIS OF SUBSTITUTED PYRIDYLGLYCOLS

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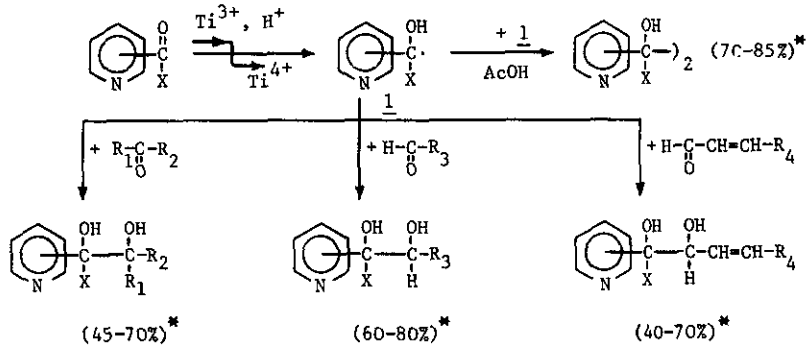
For some time we have been carrying out investigations on the use of Ti(III) species for the synthesis of symmetrical and unsymmetrical glycols both in acidic[1] and basic[2] media. Aqueous $TiCl_3$ promotes the reductive hydrodimerization of carbonyl compounds activated towards reduction by an electron-withdrawing substituent to the corresponding symmetrical glycols in high yields. In the presence of an excess of simple ketones and aldehydes, or α,β-unsaturated aldehydes, the hydrodimerization is almost suppressed and the competitive reaction leading to unsymmetrical glycols becomes predominant. Since both symmetrical and unsymmetrical pyridylglycols have great synthetic utility, mostly in relation to their pinacol-pinacolone rearrangement (several compounds of these series possess valuable and specific adrenal, cortical inhibitory activity), we report here on the facile and convenient one-step synthesis of symmetrical and unsymmetrical pyridylglycols[3] starting from pyridineketones and pyridinealdehyses under very simple experimental conditions, according to Scheme:



X= H, CH_3; R_1=R_2= CH_3;
R_1,R_2= $(CH_2)_4$, $(CH_2)_5$;
R_3= CH_3, C_2H_5, Ph;
R_4= H, CH_3, Ph;


= 2-, 4-, or 3-pyridine ring;

*products isolated yields.

The following remarks will be outlined and commented in this communication:

a) From the synthetic standpoint, the synthesis of symmetrical pyridylglycols promoted by $TiCl_3$ represents an excellent alternative to the photochemical, electrochemical and metal reduction. Besides, most of the unsymmetrical pyridylglycols obtained have never been synthetized before and the present method has considerable advantage over the existing procedure which does have limitation and requires several steps.

b) From a mechanistic viewpoint, a radical addition to the carbonyl carbon is proposed to account for the pyridilglycols formation. Ti(III) species plays a fundamental role in determining the complete selectivity of addition (only >C=O and never >C=C<) with α,β-unsaturated aldehydes.

c) Ti(III) species deserves a careful new look as a potentially useful reagent in organic synthesis (aqueous chemistry, increase of its reducing power on changing from acidic to basic medium).

1- A. Clerici and O. Porta, Tetrahedron 38, 1293 (1982); J. Org. Chem. 47, 2852 (1982).
2- A. Clerici and O. Porta, Tetrahedron Lett. 21, 1675 (1980); Tetrahedron Lett. 23, 3517 (1982).
3- A. Clerici and O. Porta, J. Org. Chem. submitted; Tetrhedron, to be submitted.