Tetrahedron Letters No. 6, pp 453 - 456, 1976. Pergamon Press. Printed in Great Britain.

REGIOSPECIFIC SYNTHETIC ROUTES TO α-SELENO CARBONYL COMPOUNDS AND TO αβ-UNSATURATED CARBONYL COMPOUNDS (1)

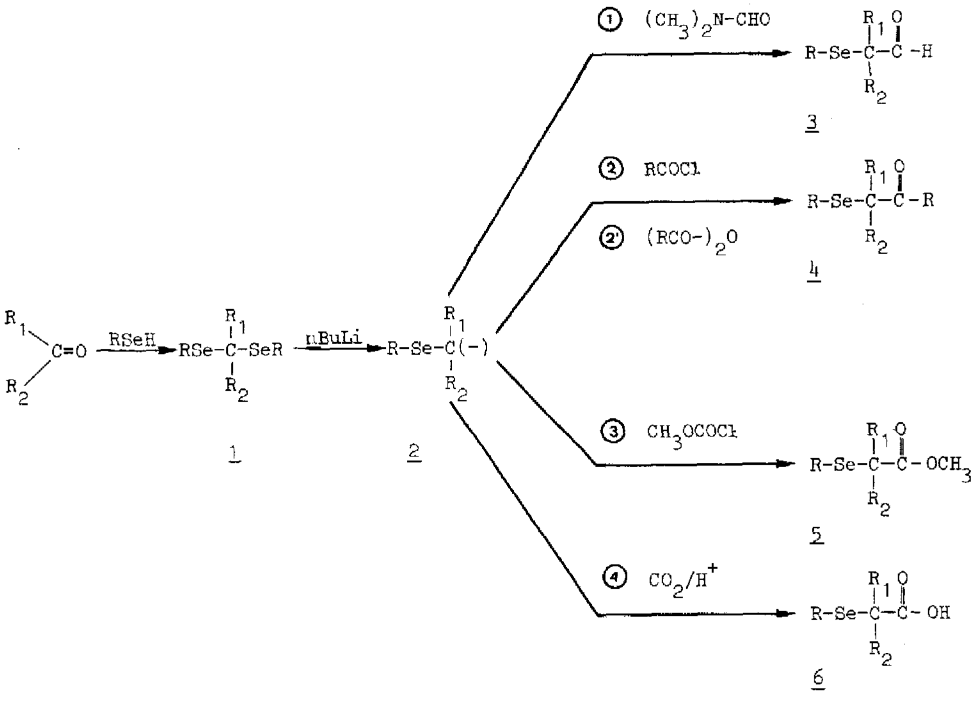
J.N. Denis, W. Dumont and A. Krief+
Département de Chimie, Facultés de Namur
61, rue de Bruxelles, B-5000 Namur (Belgium)

(Received in UK 30 October 1975; accepted for publication 24 December 1975)

α-selenoalkyl lithiums are versatile nucléophilic reagents, readily prepared from carbonyl compounds, which have already been used for the synthesis of various organic molecules (2).

This communication proposes new synthetic routes to α-seleno aldehydes 3, α-seleno ketones 4, α-seleno esters 5 and α-seleno acids 6, using α-selenoalkyl lithium as one of the two building blocks (Scheme I).

SCHEME I



The compounds 3, 4, 5 were previously synthesized (3) by Sharpless, Clive and Reich from the corresponding carbonyl compounds and were transformed to αβ-unsaturated derivatives (3) when treated with an oxidant.

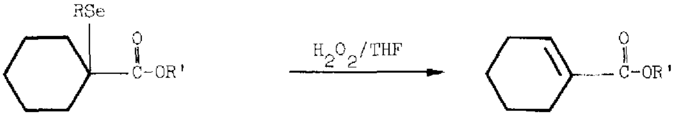
Generated from the reaction of a methylseleno or a phenylseleno acetal with n-butyl lithium at - 78°C in THF, the α-methyl as well as the α-phenyl-selenoalkyl lithium reacts with N, N-dimethylformamide, an acyl chloride or an anhydride, methyl chloroformate and carbon dioxyde to yield the corresponding carbonyl compound 3, 4, 5 and 6 (Scheme I, Table I).

Usually better results are observed when a THF solution of the carbanion 2 (-78°C) is added to a THF solution of the carbonyl compound cooled to -78°C. As already mentioned, in the case of the phenylseleno acetals, the other mode of cleavage is also observed (2b) : the phenylated carbonyl compounds (5 - 20 %) are sometimes isolated.

Somme phenylseleno derivatives were oxidized using the described procedures (3) to the corresponding αβ-unsaturated carbonyl compounds formed in high yield (80 - 90%) (Scheme II); according to our first results the oxidation of methylseleno derivatives leads to a lower yield (40 - 50 %) of αβ-unsaturated carbonyl compounds (4).

Finally, for the first time, we are able to describe the oxidation of a phenylseleno carboxylic acid to the corresponding αβ-unsaturated acid in good yield (60 %) [1) H_2O_2/THF, 0°C, 2h; 2) $Na_2S_2O_4$ solution] .

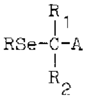
SCHEME II



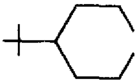
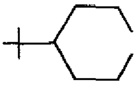
R = C_6H_5 R' = CH_3	90 % yield
R = CH_3 R' = CH_3	40 % yield
R = C_6H_5 R' = H	60 % yield

The proposed synthons have the advantage over the others (3) of wide generality and, in the case of ketonic compounds, of completely regiospecific introduction of the seleno group and of the carbon-carbon double bond.

TABLE I



$$\mathrm{RSe-\overset{\displaystyle R_1}{\overset{|}{\underset{\underset{\displaystyle R_2}{|}}{C}}}-A}$$

Reaction*	A	R_1	R_2	R	Yield**
①	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-H}$			C_6H_5	46 %
②	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-C_6H_5}$			CH_3	79 %
②	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-C_6H_5}$	H	C_6H_{13}	CH_3	65 %
②	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-C_5H_{11}}$	CH_3	CH_3	C_6H_5	44 %
②	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-CH_3}$			C_6H_5	25 %
③	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-OCH_3}$	CH_3	CH_3	C_6H_5	80 %
③	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-OCH_3}$			C_6H_5	40 %
③	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-OCH_3}$			C_6H_5	60 %
③	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-OCH_3}$	H	C_6H_{13}	CH_3	40 %
④	$\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{-OH}$			C_6H_5	70 %

*Refer to Scheme I

** of purified (silicagel chromatography plates) product

References

1) A preliminary report of this work was presented by the authors at the 25th I.U.P.A.C. Congress in Jerusalem (Israel) July 1975.

2a) *Allyl alcohol.* W. Dumont, P. Bayet and A. Krief, Angew. Chem. Int. Ed. 13, 804 (1974).
D. Seebach and A.K. Beck, Angew. Chem.Int. Ed. 14, 806 (1974)

2b) *Epoxides.* W. Dumont and A. Krief, Angew. Chem. Ind. Ed. 13, 350 (1974)
D. Van Ende, W. Dumont and A. Krief, Angew Chem. Int. Ed. 11, 701 (1975)
D. Van Ende and A. Krief, Tet. Lett. forthcoming paper.

2c) *Hydrocarbons, dienes, olefins.* Unpublished results from our laboratory. See also ref. 1

3a) K.B. Sharpless and R.F. Lauer, J. Amer. Chem. Soc. 95, 2697 (1973)

3b) C.L. Clive, J. C.S., Chem. Comm., 695 (1973)

3c) H.J. Reich, I.L. Reich and J.M. Renga, J. Amer. Chem. Soc. 95, 5813 (1973)

3d) K.B. Sharpless, R.F. Lauer and A.Y. Teranishi, J. Amer. Chem. Soc. 95, 6137 (1973)

3e) K.B. Sharpless and R.F. Lauer, J. Org. Chem. 39, 429 (1974)

3f) H.J. Reich, J.M. Renga and I.L. Reich, J. Org. Chem. 39, 2133 (1974)

3g) H.J. Reich and S.K. Shah, J. Amer. Chem. Soc. 97, 3250 (1975)

4a) Also private communication of Prof. K.B. Sharpless

4b) Work is in progress in our laboratory to find better reagents to eliminate the methylseleno groups in these compounds.