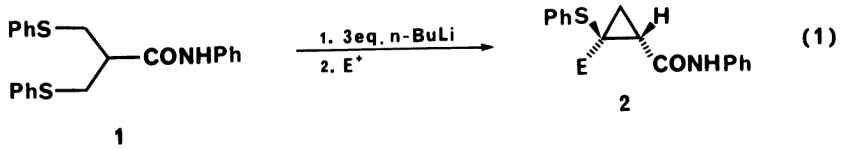
CHEMISTRY LETTERS, pp. 809-810, 1987.

A Short, Efficient, Stereoselective Synthesis of Functionalized Cyclopropanes through the Cyclization of N-Phenyl-3-phenylthio-2-(phenylthiomethyl)propanamide+

Kazuhiko TANAKA,* Keizaburo MINAMI, and Aritsune KAJI
Department of Chemistry, Faculty of Science, Kyoto University,
Sakyo, Kyoto 606

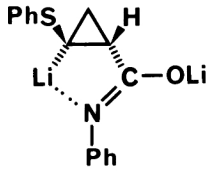
Treatment of N-phenyl-3-phenylthio-2-(phenylthiomethyl)-propanamide with 3.3 equiv. of butyllithium in THF-TMEDA produced a new dianion of 2-(phenylthio)cyclopropanecarboxamide which could react with a variety of electrophiles to give cyclopropanes with high stereoselectivity.

Functionalized cyclopropanes have recently received substantial attention as versatile building blocks in organic synthesis.[1] Here we wish to report a highly convenient method for the stereoselective cyclopropanation of N-phenyl-3-phenylthio-2-(phenylthiomethyl)propanamide (**1**). Treatment of the amide **1** with 3.3 equiv. of butyllithium[2] in THF containing 3.1 equiv. of TMEDA at -78 °C and then at 0 °C for 3 h followed by addition of electrophilic trapping reagents gave the cyclopropanes **2** in good yields. Of particular interest are the adducts derived from aldehydes. Thus, treatment of the adducts with dilute hydrochloric acid in refluxing dioxane for 4 h gave the cyclopropanated lactones (**2d-2f**) as shown in Table 1.



(1)

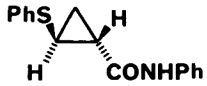
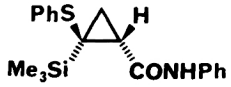
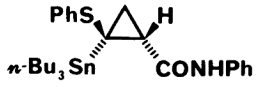
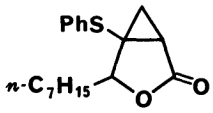
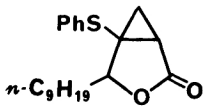
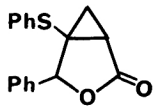
These results indicate that the electrophiles entered the cyclopropane ring selectively cis to the phenylcarbamoyl group. This high stereoselectivity can be rationalized by assuming coordination of carbamoyl moiety[3] to the lithium cation depicted in Scheme 1.



Scheme 1.

+This paper is dedicated to the late Professor Ryozo Goto, Kyoto University.

Table 1. Preparation of cyclopropanecarboxamide 2 from amide 1

Electrophile	Procedure	Product		Yield/%
H_2O	A		(2a)	70
Me_3SiCl	A		(2b)	71
n-Bu_3SnCl	A		(2c)	78
n-$C_7H_{15}CHO$	B		(2d)	55
n-$C_9H_{19}CHO$	B		(2e)	86
PhCHO	B		(2f)	74

Procedure A: (1) addition of an electrophile to the dianion; (2) chromatographic separation of the product after quenching with saturated ammonium chloride.
Procedure B: (1) addition of an electrophile; (2) lactonization of the adduct; (3) separation of the lactone by chromatography.

The experimental simplicity, high stereoselectivity, and use of readily available amide make the present method highly advantageous for the synthesis of a wide variety of cyclopropane derivatives.

References

1) L. A. Paquette, Chem. Rev., 86, 733 (1986); B. M. Trost, Acc. Chem. Res., 7, 85 (1974); T. Cohen and J. R. Matz, Tetrahedron Lett., 22, 2455 (1981); S. Danishefsky, Acc. Chem. Res., 12, 66 (1979); R. C. Gadwood, Tetrahedron Lett., 25, 5851 (1984).
2) K. Tanaka, H. Uneme, S. Matsui, R. Tanikaga, and A. Kaji, Chem. Lett., 1980, 287; K. Tanaka, H. Uneme, S. Matsui, and A. Kaji, Bull. Chem. Soc. Jpn., 55, 2965 (1982).
3) R. Goswami and D. E. Corcoran, Tetrahedron Lett., 23, 1463 (1982).

(Received January 30, 1987)