UTILIZATION OF OPTICALLY ACTIVE 4-TRITYLOXYMETHYL-2-BUTEN-4-OLIDE IN PHOTOINDUCED ASYMMETRIC (2+2) CYCLOADDITION

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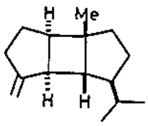
Among the naturally occurring terpenoides, β-bourbonene (1) and spatol (2) have unique tricyclo[5,3,0,$0^{2,6}$]decane skeleton. For the construction of this system by (2+2) cycloaddition, we utilized chiral butenolide (3) as a chiral source in the asymmetric induction and as carbon frameworks of 7 and 10, key intermediates in the syntheses of 1 and 2, respectively.

In the photocycloaddition of 4 and 5[1], the stereochemistry of the adduct was controlled by a chiral center at 4, and the stereoselectivity was explained by the least hindered approach of 5 to 4. On the other hand, in the intramolecular cycloaddition of 8, the direction of approach reversed and the adduct (9) was obtained exclusively.

These photoadducts (6, 9) were converted to the key intermediates (7, 10) by the removal of original chiral centers and elabolation of butan-4-olide moieties.



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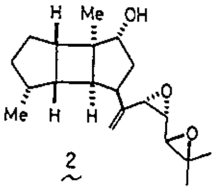

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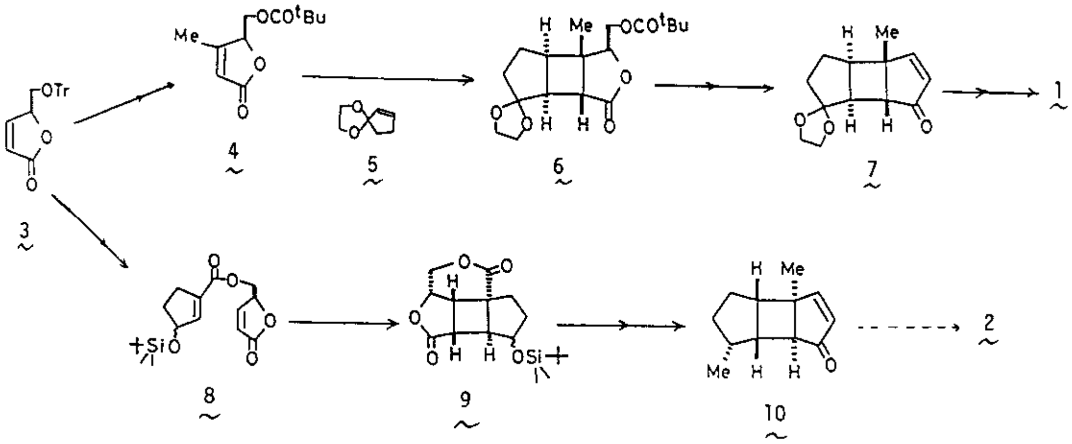

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1) K. Tomioka, M. Tanaka, and K. Koga, *Tetrahedron Lett.*, **23**, 3401 (1982).