New Features of Isoxazole Chemistry. The Reaction of Ethyl 4-Nitro-3-phenylisoxazole-5-carboxylate with 2,3-Dimethylbuta-1,3-diene

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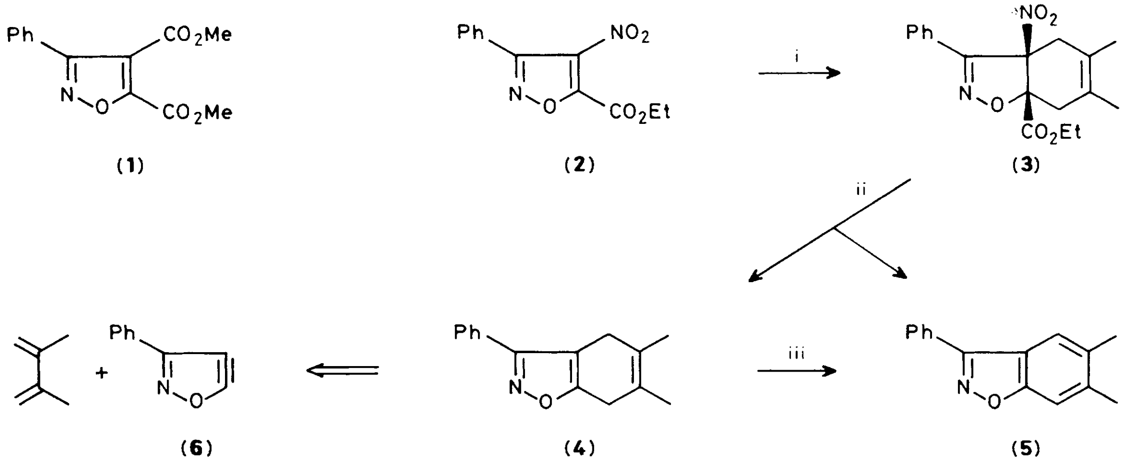
The title compound (**2**) was found to undergo a (2 + 4) cycloaddition with 2,3-dimethylbuta-1,3-diene affording the tetrahydro-1,2-benzisoxazole (**3**), which could be easily converted into the corresponding dihydro derivative (**4**) by elimination of the NO_2 and CO_2Et groups.

Although cycloadditions of 2-,[1] 3-,[2] and 4-isoxazolines[3] have been known for several years, only recently have two examples involving, in different ways, the C(4)–C(5) double bond of 'aromatic' isoxazoles been reported; namely, the $[Mo(CO)_6]$-induced reaction of variously substituted derivatives with acetylenic esters,[4] and the (4 + 2) cycloaddition of 3-methyl-5-vinylisoxazole with activated dienophiles.[5] However, the possibility of employing the above double bond as a dienophile in Diels–Alder reactions remained, to our knowledge, unexplored.

In this context and with the aim of determining if the presence of two electron-withdrawing groups at the 4- and 5-positions could provide a sufficient activation, we investigated the behaviour of compounds (**1**) and (**2**) with 2,3-dimethylbuta-1,3-diene (DMB). No reactivity was observed with (**1**) which appeared unchanged after prolonged heating



Scheme 1. *Reagents and conditions:* i, DMB, toluene, 110 °C; ii, DMB, xylene, 150 °C; iii, xylene 110—120 °C.

with DMB in xylene at 150 °C in a sealed tube; by contrast, the nitroester (**2**), easily available from α-nitroacetophenone oxime,[6] reacted with the same diene (molar ratio 1 : 5) under milder conditions (toluene, 110 °C, 48 h) to afford in good yield (87%, based on the recovered starting material) the derivative (**3**) through a (2 + 4) cycloaddition (Scheme 1). From the reaction we also isolated by flash-column chromatography a very small amount of compound (**4**) which represents the elimination product of (**3**) with loss of the nitro and ester groups. Attempts to achieve this elimination merely by thermolysis failed; the cycloadduct (**3**) was stable at 110 °C, but it completely decomposed in xylene at 150 °C, yielding a complex reaction mixture which did not contain (**4**) (^{1}H n.m.r. spectrum). Nevertheless, surprisingly, when the reaction was carried out under similar conditions in the presence of DMB (molar ratio 1 : 5, 7 h), the desired dihydro derivative (**4**) was obtained in 55—60% yields together with a minor amount of the known 1,2-benzisoxazole (**5**),[7] which, in turn, could be prepared from (**4**) by prolonged heating in the same solvent.

The peculiar role of DMB in promoting the clean loss of NO_2 and CO_2Et might be connected with a group transfer reaction, and mechanistic investigations will start from this assumption.

Since the nitroester (**2**) can be easily converted into (**4**) *via* the nitro derivative (**3**), it can be regarded as an attractive synthetic equivalent of the 4,5-didehydroisoxazole (**6**) for similar cycloaddition processes.

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