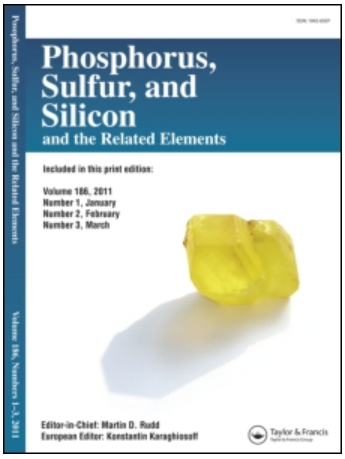


Phosphorus, Sulfur, and Silicon and the Related Elements

Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713618290

Synthesis of Some Biologically Active Cyclopente-Nones using New Organophosphorus Reagents

M. Mikołajczyk[a]; S. Grzejszczak[a]; W. Midura[a]; A. Zatorski[a]
[a] Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences, łódź, Boczna 5, Poland

To cite this Article Mikołajczyk, M. , Grzejszczak, S. , Midura, W. and Zatorski, A.(1983) 'Synthesis of Some Biologically Active Cyclopente-Nones using New Organophosphorus Reagents', Phosphorus, Sulfur, and Silicon and the Related Elements, 18: 1, 175 — 178
To link to this Article: DOI: 10.1080/03086648308075995
URL: http://dx.doi.org/10.1080/03086648308075995

Phosphorus and Sulfur, 1983, Vol. 18 pp. 175-178
0308-664X/83/1801-0175/$18.50/0

SYNTHESIS OF SOME BIOLOGICALLY ACTIVE CYCLOPENTENONES USING NEW ORGANOPHOSPHORUS REAGENTS

M.MIKOŁAJCZYK, S.GRZEJSZCZAK, W.MIDURA and A.ZATORSKI
Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences, 90-362 Łódź, Boczna 5, Poland

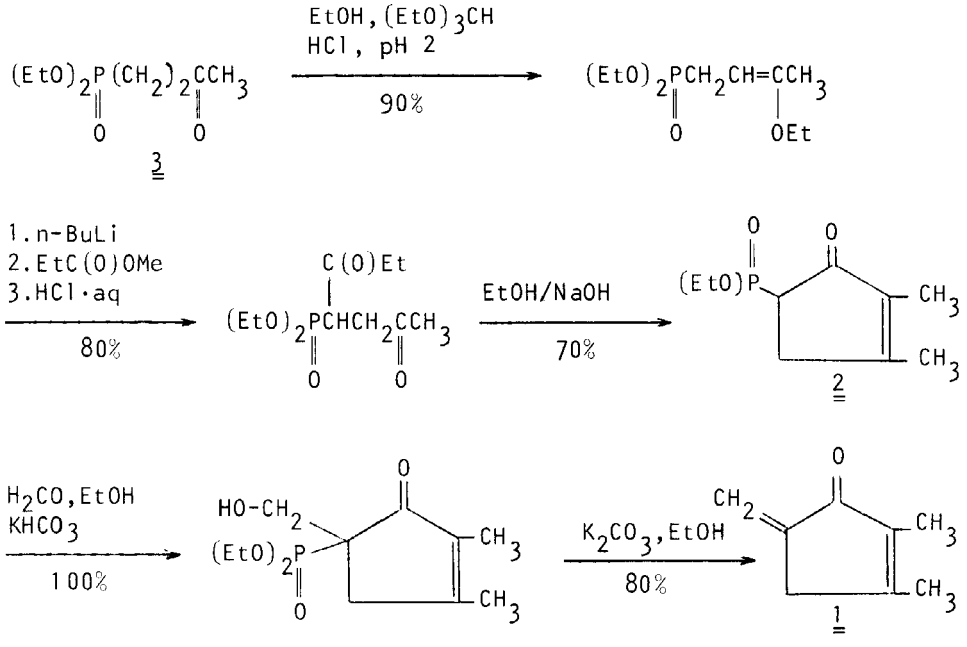
Abstract The use of organic phosphorus and sulfur compounds in the general synthesis of biologically active functionalized cyclopentenones is presented.

The cyclopentenone moiety is contained in many important natural products such as prostanoids, jasmonoids, rethrolones and methylenomycins. The most versatile synthesis of 2-cyclopentenones involves the preparation of acyclic 1,4-dicarbonyl compounds and their subsequent intramolecular base-catalyzed condensation[1].

Recently, we developed[2-4] a new approach to the synthesis of 1,4-dicarbonyl compounds employing the Horner-Wittig reaction of the properly substituted α-phosphoryl sulfides with monocarbonyl or the half-protected 1,3-dicarbonyl compounds. The utility of this approach was demonstrated by the synthesis of methylenomycin B (1), a recently isolated cyclopentenoid antibiotic. The synthesis of 2,3-dimethylcyclopenten-2-one, which is a sub-target in this synthesis, was accomplished in a satisfactory yield. However, the introduction of the exocyclic α-methylene function carried out according to Jernow et al.[5] was less efficient and the total yield of methylenomycin B prepared in this way was only 16%.

Since the Horner-Wittig reaction should also be useful for the introduction of such a function into the cyclopentenone ring, we decided to synthesise 5-diethoxyphosphoryl-2,3-dimethylcyclopenten-2-one (2) as a key compound in the alternative synthesis of methylenomycin B (1) which is shown in Scheme I. The desired compound 2 was prepared from the easily available γ-ketophosphonate (3) using rather standard procedures. The Horner-Wittig reaction of 2 with formaldehyde was found to occur under mild conditions affording methylenomycin B (1) in a high yield.

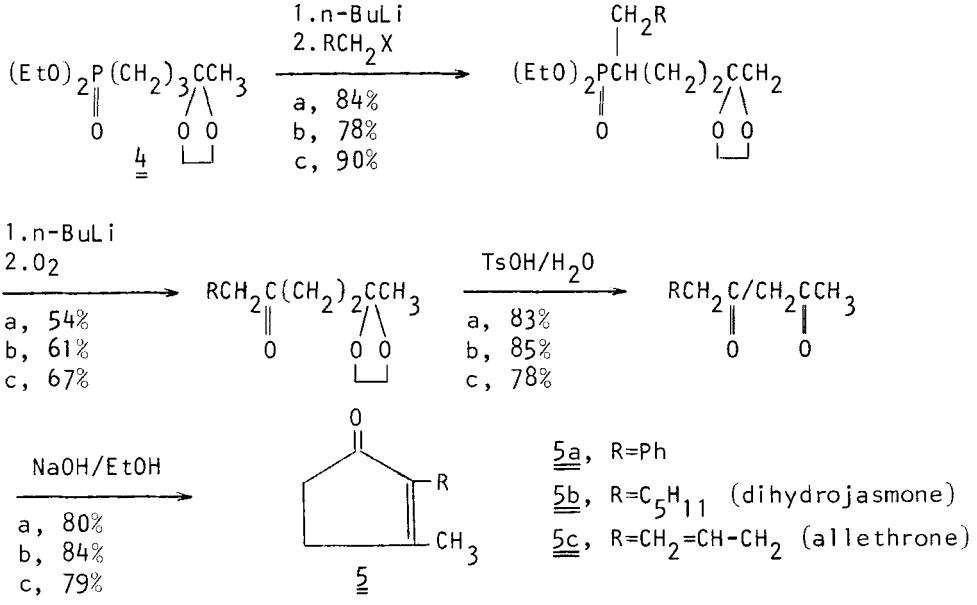
Scheme I



In an alternative approach to 2,3-disubstituted cyclopentenones we utilized the fact that oxidation of the phosphonate carbanions occurs with the P-C bond fission and the formation of carbonyl compounds. Thus, starting from δ-ketophosphonate (4) 2-phenyl-3-methyl-

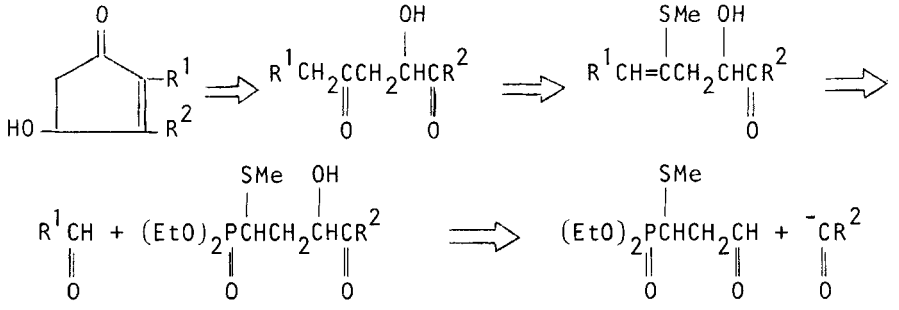
-cyclopenten-2-one (5a), dihydrojasmone (5b) and allethrone (5c) were prepared in a short and efficient way (see Scheme II).

Scheme II



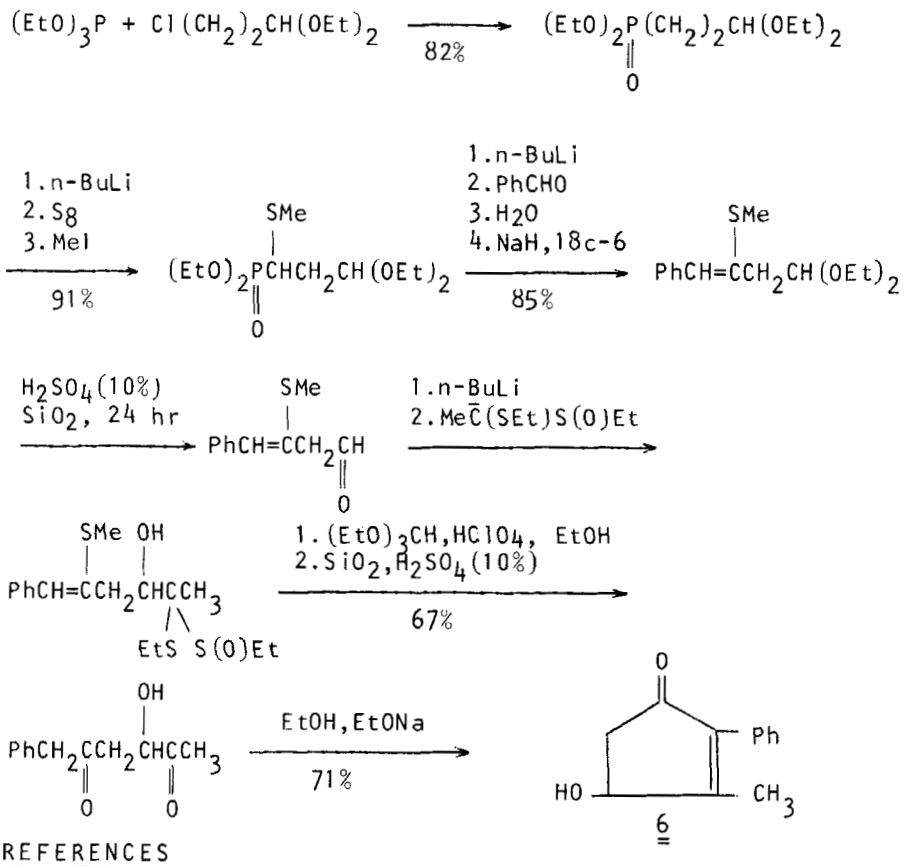
In an extension of our work on the application of organophosphorus compounds in the synthesis of functionalized cyclopentenones, we developed also a new route to 4-hydroxy-cyclopentenones. Our general synthetic strategy was deduced from retrosynthetic analysis shown in Scheme III.

Scheme III



In a practical realization, it was necessary to modify slightly the synthetic approach to 4-hydroxy-cyclopentenones suggested by retrosynthetic analysis and the synthesis of 2-phenyl-3-methyl-4-hydroxy-cyclopenten-2-one (6) exemplifies the solution of this goal (see Scheme IV)

Scheme IV



REFERENCES

1. R.A.Ellison, Synthesis, 1973, 397.
2. M.Mikołajczyk, S.Grzejszczak, K.Korbacz, Tetrahedron Letters, 1981, 22, 3097.
3. M.Mikołajczyk, S.Grzejszczak, P.Łyżwa, Tetrahedron Letters, 1982, 23, 2237.
4. M.Mikołajczyk, Current Trends in Organic Synthesis, Ed. H.Nozaki, Pergamon Pres, 1983, 347.
5. J.Jernow, W.Tautz, P.Rosen, T.H.Williams, J.Org.Chem. 1979, 44, 4212.