Preparation of 3,3-Diethoxypentan-2-one from the Diethyl Acetal of Ethyl 2-Oxobutyrate and $(CH_3)_2CuLi$

By SHARON A. HUMPHREY, J. L. HERRMANN, and R. H. SCHLESSINGER*†

(Department of Chemistry, University of Rochester, Rochester, New York 14627)

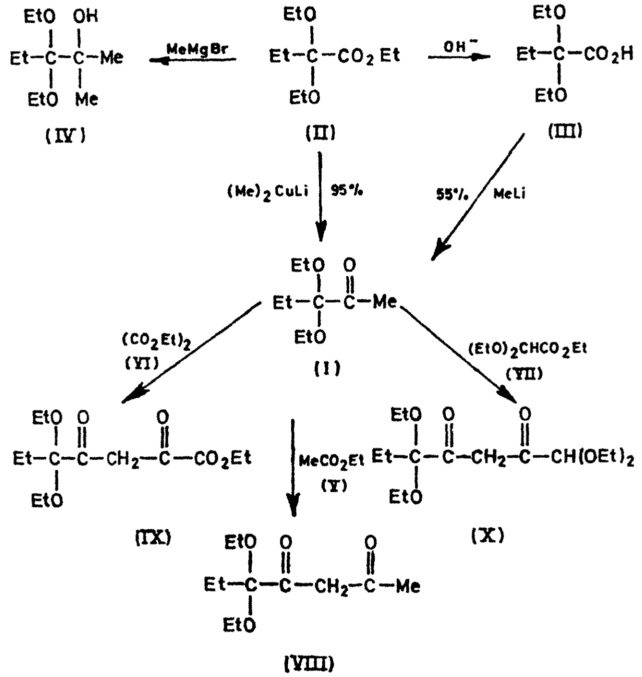
Summary. Reaction of Me_2CuLi with the diethyl acetal of ethyl 2-oxobutyrate gives the synthetically useful methyl ketone (I) in nearly quantitative yield; similarly, acetophenone is formed in good yield from the reaction of ethyl benzoate and Me_2CuLi.

WE report our studies with the potentially valuable synthon 3,3-diethoxypentan-2-one (I). (I), although not directly available by acetalization of pentane-2,3-dione, has been reported to form in good yield by reaction of ethyl 2,2-diethoxybutyrate (II) with excess of MeMgBr in ether

---

† Alfred P. Sloan fellow.

solution.[1] It was also claimed that (I) could be obtained by reaction of the acetal acid (III) with excess of MeLi.[1]



We have repeated these experiments and find that reaction of ester (II) with methylmagnesium bromide leads only to (IV), while acid (III) with methyl-lithium gives the desired ketone in low yield. Although the latter reaction has been developed to give a 55% yield of (I) from (III), the overall reaction sequence (II) → (III) → (I)[1] is tedious.

To avoid this method, the behaviour of ester (II) towards a variety of organometallic reagents including Me_2CuLi was examined. Me_2CuLi is known to react with acid chlorides to give methyl ketones.[2] We have found that reaction of (II) with excess of Me_2CuLi cleanly gives ketone (I) in high yield. For example, when one equivalent of (II) in ether solution (0·1 M) is added to six equivalents of Me_2CuLi in ether and the resulting mixture is heated under reflux for 3·5 h, ketone (I) (b.p. 37—39°/1·5 mm) is formed in 95% yield.‡ Ethyl benzoate when treated with three equivalents of Me_2CuLi gives acetophenone (85%) and dimethylphenylmethanol (5—15%). Other aliphatic esters, however, do not react cleanly with Me_2CuLi. Hence, while the reaction of ester (II) with Me_2CuLi is a convenient method of preparing large quantities of ketone (I) the transformation does not appear general for aliphatic cases.

Ketone (I) undergoes ready condensation with esters (V), (VI), and (VII) to give in good yield the corresponding β-diketones (VIII), (IX), and (X), respectively.

We thank the National Institutes of Health for support of this work.

(*Received, June* 14*th*, 1971; *Com.* 963.)

---

‡ Satisfactory analytical data were obtained for all new compounds.

[1] P. Seifert, E. Vogel, A. Rossi, and H. Schinz, *Helv. Chim. Acta*, 1950, **33**, 725.
[2] G. H. Posner and C. E. Whitten, *Tetrahedron Letters*, 1970, 4647.