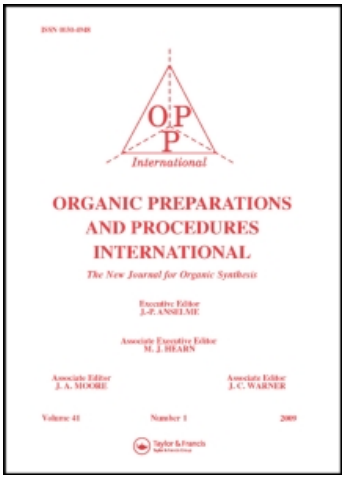

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SYNTHESIS OF 5-HYDROXYMETHYL-1,4-DIOXAN-2-ONE

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SYNTHESIS OF 5-HYDROXYMETHYL-I,4-DIOXAN-2-ONE

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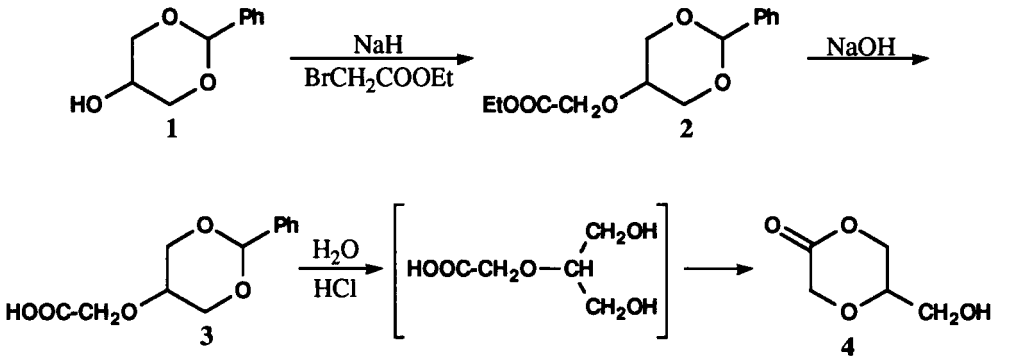
1,4-Dioxan-2-one derivatives find application in several fields, e.g. polymers,1 corrosion inhibitors,[2] biomaterials.[3,4] Due to the additional functionality, 5-hydroxymethyl-1,4-dioxan-2-one (**4**) may be regarded as a useful intermediate. However, in spite of the simplicity of its structure, this compound is still unreported. Its synthesis is described here.



The 1,3-protected glycerol **1** was reacted with ethyl bromoacetate in the presence of sodium hydride to give ester **2**. Alkaline hydrolysis of the latter provided the corresponding acid **3**. This compound was submitted to acidic hydrolysis and subsequent distillation *in vacuo*. Redistillation of

the resulting oil gave lactone **4** in pure state. The overall yield of the above sequence was 35%. No improvement was achieved upon direct hydrolysis of **2** in acidic medium. Under these conditions, a complex mixture was formed from which the desired lactone **4** was isolated only in a minor quantity.

EXPERIMENTAL SECTION

Melting points were determined on a Büchi apparatus and are uncorrected. IR spectra were taken on a Perkin-Elmer 1725X FT spectrophotometer. NMR spectra were recorded on Varian XL-200 instrument; chemical shifts are given in ppm from TMS. Mass spectra were measured on a WG-70EQ apparatus.

Ethyl 2-[(2-Phenyl-1,3-dioxan-5-yl)oxy]acetate (2).- A solution of **1**[5] (6.0 g, 33 mmoles) in anhydrous benzene (120 mL) was treated first with sodium hydride (1.6 g, 66 mmoles), then with ethyl bromoacetate (8.2 g, 49 mmoles). The resulting mixture was stirred at room temperature for 3 hrs. After dilution with benzene (600 mL), the mixture was poured into ice-water (200 mL). The organic layer was dried over sodium sulfate and evaporated. The residue was distilled *in vacuo* to give an oil, bp. 155-160°/0.1 torr which crystallized on standing, mp. 60-62° (6.3 g, 72%).
IR (Nujol): 1750 cm^{-1}; ^1H NMR (90 MHz, $CDCl_3$): δ 1.30 (3H, t), 3.4-3.6 (1H, m), 4.0-4.5 (8H, overlapping), 5.51 (1H, s), 7.2-7.6 (5H, m); MS (EI, 70 eV): m/z 266 (M^+).

Anal. Calcd. for $C_{14}H_{18}O_5$: C, 63.14; H, 6.82. Found: C, 63.27; H, 6.59

2-[(2-Phenyl-1,3-dioxan-5-yl)oxy]acetic Acid (3).- A solution of **2** (6.1 g, 23 mmoles) in ethanol (80 mL) was treated with 1*M* NaOH in ethanol (70 mL) and stirred at room temperature for 1.5 hr. The solvent was removed under reduced pressure. The residue was taken up with water, washed with dichloromethane, acidified by concentrated HCl, and extracted with dichloromethane. The organic solution was dried over sodium sulfate and evaporated. Trituration of the residue with diisopropyl ether gave a solid which was collected to give acid **3** (4.1 g, 75%), mp. 104-105° (2-propanol).
IR (Nujol): 2700-3300, 1710 cm^{-1}; ^1H NMR (90 MHz, $CDCl_3$): δ 3.4-3.6 (1H, m), 4.0-4.5 (6H, overlapping), 5.55 (1H, s), 7.2-7.6 (5H, m), 9.8 (1H,br s).

Anal. Calcd. for $C_{12}H_{14}O_5$: C, 60.50; H, 5.93. Found: C, 60.72; H, 6.10

5-Hydroxymethyl-1,4-dioxan-2-one (4).- A suspension of **3** (12 g) in aqueous 5% HCl (240 mL) was stirred at room temperature for 1.5 hr. The resulting solution was washed with a small amount of dichloromethane and the aqueous layer was evaporated under reduced pressure. The residue was distilled *in vacuo*, bp. 160-170°/0.5 torr. Redistillation of the crude product, bp. 135-140°/0.1 torr, gave lactone **4** as a colorless oil (4.3 g, 65%). IR (Nujol): 3420, 1735 cm^{-1}; ^1H NMR (200 MHz, $CDCl_3$): δ 2.5 (1H, br s), 3.6-4.1 (3H, m), 4.2-4.7 (4H, overlapping); ^{13}C NMR (200 MHz, $CDCl_3$): δ 61.4 (t), 65.5 (t), 69.3 (t), 72.0 (d), 166.1 (s); MS (DIS, 70 eV): m/z 132 (M^+).
Anal. Calcd.for $C_5H_8O_4$: C, 45.45; H, 6.10. Found: C, 45.17; H, 6.17

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CONVENIENT ONE-POT PROCESSES FOR THE PREPARATION OF CHLOROACETALDEHYDE DIALKYL ACETALS

Submitted by (09/09/91) M. S. Malik*, N. K. Sangwan, O. P. Malik and K. S. Dhindsa

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Chloroacetaldehyde dialkyl acetals are versatile intermediates in the synthesis of compounds of biological significance. The commonly used methods for their preparation involve the alcoholysis of 1,2-dichloro-1-alkoxyethanes,[1] chlorine addition and alcoholysis of vinyl chloride[2] or vinyl alkyl ethers,[3] addition of alkoxy halides to vinyl alkyl ethers,[4] acetalization of chloroacetaldehyde,[5] chlorination of ethanol,[6] and electrolysis of ethanol and hydrogen chloride.[7] The starting material used in all these methods either require a multistep process for their production or rigorous experimental conditions for their conversion to title products. This communication reports two convenient and rapid one-pot processes for the preparation of these compounds by chlorination of acetaldehyde[8] (or paraldehyde) or of vinyl acetate[9] and subsequent *in situ* acetalization of the generated chloracetaldehyde or 1,2-dichloroethyl acetate respectively with simple unbranched alcohols. These processes seem to be advantageous as the reaction times are shorter and overall yields are better when compared to other methods.