not deliquescent. After recrystallization from aqueous alcohol and drying over calcium chloride it was analyzed. *Anal.* Calcd. for $C_7H_{14}O_7$: C, 39.98; H, 6.72. Found: C, 40.06; H, 6.62.

MUTAROTATION OF β-GLUCOHEPTOSE AT 20° IN 5% AQUEOUS SOLUTION

$$[\alpha]^{20}_{D} = +11.31 \times 10^{-0.050t} - 11.28 \times 10^{-0.0108t} - 0.13$$

Time, minutes	$[\alpha]^{20}_{D}$ Obs.	k Initial period	$k_1 + k_2$ Final period	$[\alpha]^{20}_{D}$ Calcd. from eq.
0	(−0.1)	...	...	−0.1
1.3	−1.4	...	...	−1.31
3.2	−2.7	0.0496	...	−2.73
5.1	−3.7	.0489	...	−3.78
7.5	−4.7	.0497	...	−4.72
10	−5.2	.0483	...	−5.35
15	−5.8	.0487	...	−5.89
18	−5.93	.0503	...	−5.92
20	−5.9	.0507	...	−5.86
30	−5.2	...	...	−5.12
40	−4.3	...	...	−4.19
50	−3.4	...	0.0106	−3.38
60	−2.7	...	.0105	−2.67
70	−2.1	...	.0108	−2.11
80	−1.6	...	.0113	−1.67
90	−1.3	...	.0110	−1.33
100	−1.1	...	.0106	−1.06
120	−0.7	...	.0108	−0.70
24 hrs.	−0.13	...	...	− .13

The mutarotation cannot be expressed by the usual first order equation but, as may be seen from the calculated values given in the table, it is adequately expressed by an equation containing two exponential terms corresponding to two well-defined reactions. The velocity constants for the initial reaction were calculated by the method of Lowry and Smith [*J. Phys. Chem.*, **33**, 9 (1929)]. The uniform values show that the initial change follows approximately the course of a first order reaction. The constants calculated from forty minutes on are uniform also, which shows that the final change follows the course of a first order reaction. The initial change is approximately five timee as fast as the final and is sufficiently large to permit its study in more detail than is possible with ribose and other known sugars which exhibit this type of mutarotation.

The complex character of the mutarotation reaction is evidence that the original substance on dissolving in water changes into another form or forms which slowly pass, at least in part, into one or more additional substances. The various substances may contain different ring structures or possibly the changes in rotation may be due in part to the presence of endocyclic bridge isomers [Fuson, *Chem. Reviews*, **7**, 347 (1930)] of one ring type. In any case the new crystalline form of β-glucoheptose may contain an open chain, furanose or pyranose structure. Hence the writer refrains from classifying it until its reactions and properties have been studied further.

NATIONAL BUREAU OF STANDARDS HORACE S. ISBELL
WASHINGTON, D. C.

RECEIVED NOVEMBER 22, 1934

THE REACTION OF ETHYLENE OXIDE WITH ACETYLENIC GRIGNARD REAGENTS

Sir:

In a recent article Faucounau [*Compt. rend.*, **199**, 605 (1934)] describes the preparation of some acetylenic alcohols by the action of ethylene oxide on acetylenic Grignard reagents and the subsequent hydrolysis of the products obtained. During the past year we have been working on the same reaction [Danehy, Master's dissertation University of Notre Dame, 1934] and have prepared 3-nonyn-1-ol and 1-phenyl-1-butyn-4-ol as reported by Faucounau, obtaining yields corresponding with his; we have also prepared 3-octyn-1-ol, b. p. 97° (15 mm.); n^{25}_{D} 1.4542; d^{25}_{4} 0.8765. We also have obtained other products from these reactions in yields at least as large as the yields of the alcohols by extracting the aqueous layer with ether after hydrolysis of the Grignard complex. Faucounau has failed to report these non-alcoholic products. Because of the water solubility, molecular weight and other physical properties of these compounds, it is very likely that the phenyl-substituted product (b. p. (15 mm.) 55°) isolated by us along with the 1-phenyl-1-butyn-4-ol is identical with the 2-phenyl-4,5-dihydrofuran obtained by Faucounau in a series of reactions subsequently carried out with the 1-phenyl-1-butyn-4-ol, and that the amyl and butyl compounds isolated by us are similar in nature. We are investigating the structures of these compounds.

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